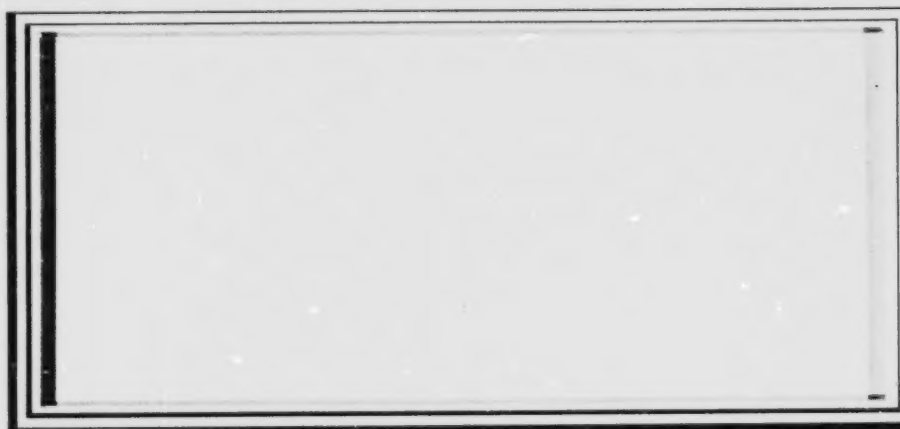




ZENON Environmental Inc.

REVERSE OSMOSIS SEPARATION OF
MODEL COMPOUNDS IN
HEPTANE AND TOLUENE SOLUTIONS
DSS File No. 07SQ.23440-4-9132,
Contract Serial No. 0SQ84-00371
FINAL REPORT

Prepared for:
DEPARTMENT OF SUPPLY AND SERVICES
Science and Professional Services Directorate

Prepared by:
ZENON ENVIRONMENTAL INC.
845 Harrington Court
Burlington, Ontario
June 18, 1986

MICROMEDIA

AUG 18 1986

238 pp

File No. C0854027



Zenon Environmental Inc.

845 Harrington Court, Burlington, Ontario L7N 3P3 Canada Telephone: (416) 639-6320 Telex: 061-8734

File No. C0854027

June 18, 1986

Dr. Brian Farnand
Energy Research Laboratories
Department of Energy, Mines and Resources,
Canada
555 Booth Street
Ottawa, Ontario
K1A 0G1

Re: **Reverse Osmosis Separation of Model Compounds in Heptane and
Toluene Solutions**
DSS File No. 07SQ.23440-4-9132, Contract Serial No. 0SQ84-00371

Dear Brian:

I am pleased to submit the final report on the above referenced project incorporating your suggested changes and additions.

With the submission of the final report, ZENON's contractual obligations to this project have been completed. The write up of our safety considerations for equipment, operation, and personnel will be forwarded to you within the next few days, for your information.

Sincerely,


John J. Bancsi,
Project Engineer

JJB/mp

Encl.

cc. Mr. Romeo Berti

TABLE OF CONENTS

	<u>Page No.</u>
SUMMARY	(i)
1.0 INTRODUCTION	1 - 1
2.0 EXPERIMENTAL	2 - 1
2.1 EQUIPMENT	2 - 1
2.1.1 STATIC TEST CELL	2 - 1
2.1.2 CONTINUOUS FLOW CELL SYSTEM	2 - 1
2.2 MATERIALS	2 - 5
2.2.1 WATER	2 - 5
2.2.2 ORGANIC COMPOUNDS	2 - 5
2.2.3 POLYMERS FOR MEMBRANE FABRICATION	2 - 6
2.3 EXPERIMENTAL METHODS	2 - 6
2.3.1 SOLVENT EXCHANGE OF MEMBRANES	2 - 6
2.3.2 STATIC CELL TESTS: MEMBRANE-SOLVENT COMPATIBILITY	2 - 6
2.3.3 CONTINUOUS FLOW CELL TESTS	2 - 7
2.3.4 ANALYTICAL METHODS	2 - 9
2.3.4.1 INSTRUMENTAL METHODS	2 - 9
2.3.4.2 PREPARATION OF CALIBRATION STANDARDS	2 - 10
2.3.4.3 ESTIMATES OF ANALYTICAL ERROR	2 - 10
2.4 MEMBRANE FABRICATION	2 - 10
2.5 MASS TRANSFER CHARACTERISTICS OF TEST CELLS: DETERMINATION OF SOLVENT FEED FLOWRATES	2 - 15

TABLE OF CONENTS Continued

	<u>Page No.</u>
3.0 RESULTS	3 - 1
3.1 MASS TRANSFER CHARACTERISTICS OF THE TEST CELLS	3 - 1
3.2 STATIC CELL TESTS	3 - 2
3.3 REVERSE OSMOSIS SEPARATION RUNS WITH ORGANIC SOLUTE/ SOLVENT MATRICES	3 - 4
3.3.1 OVERALL OBSERVATIONS	3 - 4
3.3.2 RESULTS OF METHANOL SEPARATION RUNS	3 - 7
4.0 RECOMMENDATIONS	4 - 1
REFERENCES	R - 1
APPENDIX A - SALT SEPARATION TEST DATA	
APPENDIX B - HEPTANE TEST DATA	
APPENDIX C - TOLUENE TEST DATA	
APPENDIX D - CYCLOHEXANE TEST DATA	
APPENDIX E - DENSITY-VISCOSITY CORRECTION FACTORS TO 25°C FOR WATER	
APPENDIX F - PHOTOGRAPHS OF CONTINUOUS FLOW CELL TEST SYSTEM AND NRC TYPE TEST CELL	

SUMMARY

Recent developments in membrane technology have indicated a considerable potential for reverse osmosis separation of binary organic solutions. Despite the need for more energy-efficient and cost-effective separation technologies in industry (such as petrochemical and petroleum refining), separation of organic solutes from aliphatic and aromatic solvents have not been widely studied.

This report presents the results of the separation of model solutes from aromatic (toluene) and aliphatic (heptane and cyclohexane) solvents. The report forms a significant new datapool, available to the scientific community, that fills the existing gaps in knowledge and helps pave the way for new industrial applications of membrane technology.

Preliminary tests showed that membranes fabricated of cellulose acetate butyrate (CAB), cellulose triacetate (CTA), and polyamide nitrile (PAN) were compatible with the above solvents. The membranes were cast in two porosities. The solvent permeation rates through the membranes were comparable to or better than water flux rates through commercially available membranes.

The solute rejections were low since the solutes were similar to the solvents in molecular weight and physical properties.

The separation of methanol is of particular interest to the production of new petroleum base antiknock compounds for automotive fuel. The preferential separation of methanol from reactor effluent is important since methanol interferes with subsequent reactions. The

data presented here shows that CTA membrane preferentially permeates methanol from heptane solution.

The methanol separation information is an immediate benefit derived from this work and the balance of the data should be applied to other industrial situations as preliminary information.

1.0 INTRODUCTION

Energy, Mines and Resources (EMR) has contracted ZENON to carry out experiments related to their research into membrane separation of organic solutions. Solutions of 37 organic solutes in 3 solvents were tested. The membranes to be used were specified by EMR and fabricated by ZENON. The compatibility of membranes and solvents was evaluated by soaking the membranes in the solvent and pressurized static cell test. Only the membranes compatible with all three solvents were used in the flowthrough test cells.

Due to the flammability of the solvents, the tests were carried out in an explosion and fire containment room with all electrical equipment encased in explosion proof housing. An extensive list of safety equipment was incorporated in the test room to protect the operators.

For this unique application, the construction materials' compatibilities with the solvents have been carefully considered. Nevertheless, at first, serious problems were encountered as the pump and the elastomer used in the seals were not compatible with the solvents, and the configuration (piston) of the pump further aggravated the problem by quickly eroding the swollen seals. This problem was eliminated by the use of a pump with diaphragms made of Eypel-F (Ethyl Corp., Baton Rouge, Louisiana) a polyfluoroalkoxyphosphorazene elastomer.

This report outlines the work carried out by ZENON. The configuration of the test apparatus, membrane fabrication procedures, tests, and analytical methods are presented along with sample mass

transfer calculations for the test cells and a short discussion of the results. The data collected are presented in the Appendices.

2.0 EXPERIMENTAL

2.1 Equipment

2.1.1 Static Test Cell

The static cell test system is shown schematically in Figure 2-1. The tester consisted of a modified Millipore stainless steel filter vessel accommodating a membrane about 5 cm in diameter, a gas sampling cylinder used as a solvent reservoir, nitrogen cylinder, pressure gauge, and assorted valves and fittings. The materials of construction were 316 stainless steel, teflon and viton.

2.1.2 Continuous Flow Cell System

The schematic diagram of the continuous flow cell system design is shown in Figure 2-2. Photographs of the test system and test cell are presented in Appendix F.

Only 316 stainless steel, viton, and teflon were allowed to contact the process solutions.

Initially a "Cat Pump" Model #333 (Cat Pump Corp. Minneapolis, MN), (piston type) with wetted surfaces made of stainless and viton was used. For runs with solvents, a Hydra-cell D-10 (Wanner Engineering Inc. Minneapolis, MN) pump with PNF diaphragm was borrowed from ZENON stock. The "Cat Pump" did not withstand the solvent environment. The Hydra-cell pump was slowed to about one fifth of maximum speed.

A master gauge was placed in the system (refer to Figure 2-2, part 15) after every 50 hours of operation and was used to calibrate the system pressure gauge (Figure 2-2, Part 2). The periodic calibration of the system's pressure gauge ensured accurate

STATIC CELL TESTER

FIGURE 2-1

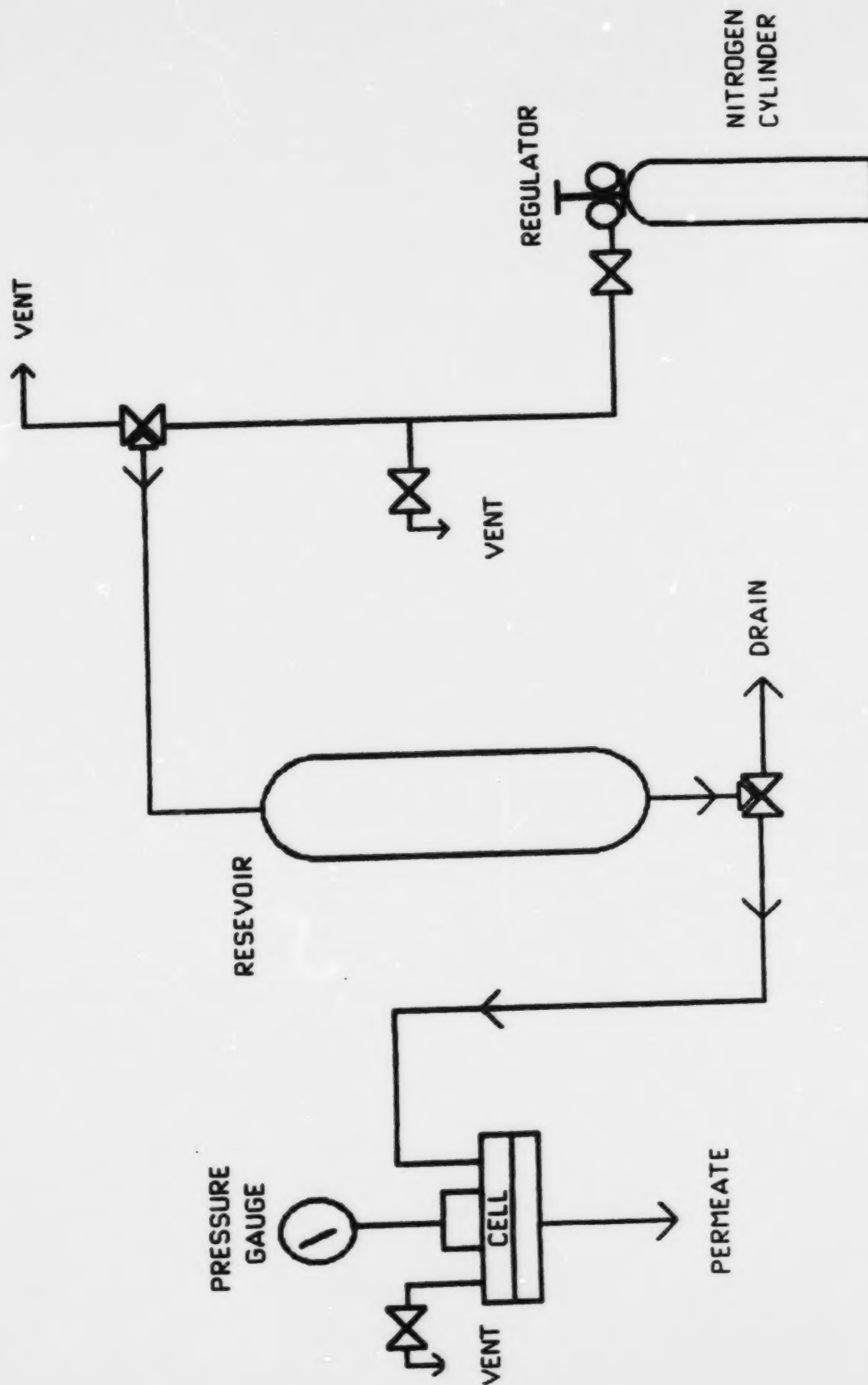
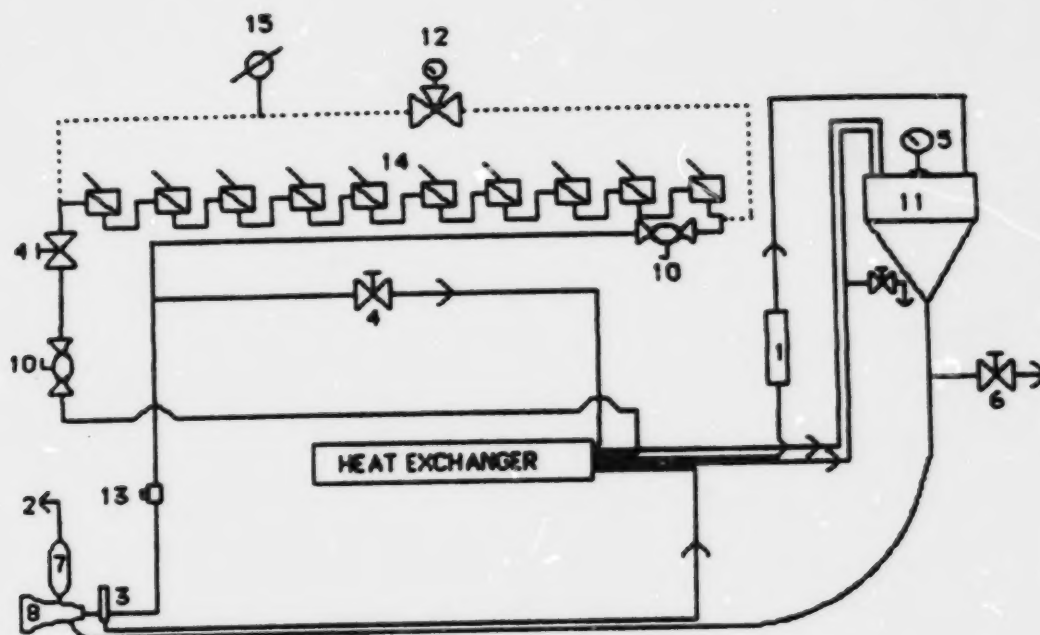


FIGURE 2-2

SCHEMATIC OF THE REVERSE OSMOSIS MEMBRANE TEST APPARATUS



LEGEND

- | | |
|------------------------------|--------------------------------------|
| 1. FLOW METER | 9. TEST CELLS |
| 2. NITROGEN GAS BALANCE LINE | 10. CELL ISOLATION BALL VALVE |
| 3. DIVERT VALVE | 11. FEED TANK |
| 4. BY-PASS VALVE | 12. THREE WAY VALVE & PRESSURE GAUGE |
| 5. TEMPERATURE GAUGE | 13. FILTER |
| 6. DRAIN VALVE | 14. TEST CELLS / MEMBRANES |
| 7. ACCUMULATOR | 15. MASTER GAUGE / CONNECTION |
| 8. PUMP | |

pressure measurement. When the master gauge was not used, it was removed from the system, to ensure that it was not altered by vibration during normal operation.

The system has an internal hold up volume of 1.41 L and the tank has a holding capacity of 15.46 L.

The test cells were of NRC design with an active surface area of 13.3 cm².

In normal operation, test solution flowed by gravity from the tank through a flexible teflon tube to the pump inlet. On the outlet side of the pump, a Greer accumulator was installed to dampen the vibrations from the piston action. The accumulator was not needed when the Hydra-cell pump was used. The fluid then flowed past the pressure relief valve, set at 1500 psi. A needle valve was located on the outlet of the cells and was used in conjunction with the by-pass valve to regulate the pressure and flow throughout the system. The solution flowed at the desired rate through the bank of up to 12 cells, into the heat exchanger and then through a flow meter, and back into the feed tank. The balance of the fluid entered the by-pass valve, flowed through the heat exchanger, and back to the feed tank. The cells can be isolated from the rest of the system with ball valves at both the inlet and the outlet.

The system pressure was monitored at both the cell bank inlet and outlet with the use of a line joining the inlet and outlet of the cells and the three-way valve. The pressure gauge was attached to the centre connection of the three-way valve.

The outer shell and end caps of the heat exchanger was made of polyvinylchloride (PVC). The tube-side consisted of coiled 316

stainless steel tube to minimize shell-side volume and facilitate the required surface area for heat transfer. The process fluid flowed through the stainless steel tube. Tap water was manually metered to the shell side in accordance with temperature in the feed reservoir.

The heat exchanger was used in the system on three separate flow streams to serve two purposes; to cool test fluid to the desired temperature, and to condense any solvent which might have volatalized upon release into a low pressure zone from a high pressure zone (ie. to the bypass line from pump outlet).

Samples for analysis were collected from the permeate lines of individual test cells for permeate sample, and from the bypass line for the feed or concentrate sample.

2.2 Materials

2.2.1 Water

All water used in testing was prepared by passing tapwater through a reverse osmosis unit, followed by carbon adsorption, and a second reverse osmosis unit. Minimum resistivity of this water was 30,000 ohms/cm and TOC was below 0.05 mg/L.

2.2.2 Organic Compounds

The organic solutes obtained were of the highest quality available from Aldrich Chemical Co. (Milwaukee, Wisconsin). The solvents toluene, heptane, and cyclohexane were technical grade since large quantities were required and the cost of the higher grades was prohibitive.

2.2.3 Polymers for Membrane Fabrication

Most of the polymers were supplied by Dr. Farnand, of the Scientific Authority. The balance of the polymers were purchased from Aldrich Chemical Co. The quality of the polymers was not specified.

2.3 Experimental Methods

2.3.1 Solvent Exchange of Membranes

The membranes were supplied immersed in 50% isopropanol-water solution. To transfer the membrane from the isopropanol-water solution to the test solvent involved a five step process. The cut membrane was moved from the isopropanol-water solution it was delivered in, into a 75% isopropanol solution and then into pure isopropanol. At each step, the membrane was allowed to stand in the receiving solution for 30 minutes. The membrane was contacted with three aliquots of each receiving solution.

The membrane was then transferred from the isopropanol to 50% test solvent-isopropanol solution. The membrane was allowed to stand 30 minutes in each of three aliquots of this solution. The membrane was similarly transferred to the 75% test solvent-isopropanol solution and finally to the test solvent. The membranes were kept constantly wet with the test solvent prior to and for the duration of the test.

2.3.2 Static Cell Tests: Membrane-Solvent Compatibility

The membrane-test solvent compatibility was investigated using the static cell testing apparatus shown in Figure 2-1.

A set of membranes were placed into the static cell and the solvent flux through the membrane was measured on the day the membranes (12 of each type) were exchanged into the test solvent. The balance of the membranes were allowed to stand separately in the three solvents for a period of up to a month. Three times during that period (at 2, 3, and 4 weeks), the solvent flux through the membranes was measured with the static cell tester.

The static cell tester was operated as follows:

- i) The appropriate solvent was placed into the reservoir.
- ii) The membrane was mounted in the cell.
- iii) The solvent was allowed to flow into the cell under gravity to displace the air in the cell.
- iv) The system was sealed by closing the valves and was pressurized to 690 kPag (100 psig) with nitrogen.
- v) After pressurization, five minutes was allowed to elapse to allow the system to reach equilibrium.
- vi) After the five minute period, the solvent flow rate was measured.

The above static cell test was repeated with each membrane in each solvent.

2.3.3 Continuous Flow Cell Tests

The continuous flow cell tests were carried out with the system shown in Figure 2-2.

The new membranes were compressed at 20% over pressure of 8280 kPag (1200 psig) for four hours prior to the test.

The following is the generalized test procedure:

- i) Weigh clean vials for samples.
- ii) Fill system with 4 L pure solvent.
- iii) Turn on system and run at desired pressure for 15 minutes or until a minimum of 5 mL permeate has been collected from each cell.
- iv) Control temperature of solvent in the reservoir to $25 \pm 2^{\circ}\text{C}$.
- v) Allow 50 mL solvent to run through the tap line before collecting the feed sample.
- vi) Collect 5 mL permeate from each cell and record the time required to collect the 5 mL sample.
- vii) Turn system off (for safety) and immediately weigh the vials with the permeate samples.
- viii) Turn system on and after 15 minutes, pour in the 1 L stock solution containing the solute and approximately 60 or 70 mL solvent to makeup for the samples collected. Mix at no pressure for 15 minutes.
- ix) Set desired pressure and wait as in (iii) before collecting samples.
- x) Collect a "before permeation" feed sample as in (v).
- xi) Collect permeate samples as in (vi).
- xii) Collect an "after permeation" feed sample as in (v).
- xiii) Weigh samples immediately.
- xiv) Change pressure to second desired pressure and repeat (ix) through (xiii).
- xv) After the second pressure run is completed, drain the system.

- xvi) Rinse the system twice with 2 L pure solvent at previous pressure until 5 mL permeate has run through the permeate lines.

The above procedure was repeated for each solute in each of the three solvents used. New membranes were used with each solvent.

2.3.4 Analytical Methods

2.3.4.1 Instrumental Methods

An approximate 1 mL portion of the samples collected during the runs was transferred into autosample vials. The autosample vials were sealed with crimped aluminum caps with teflon lined septum. The auto sample vials were stored in a freezer until analysis. Three calibrations standards in the concentration range of 0 to 50 mmol/L were prepared at the same time as the test was conducted and were identically stored until analysis.

The samples were analyzed with either a Hewlett-Packard 5880 gas chromatograph equipped with autosampler, flame ionization detector (FID) and computerized controls and data processing or with a Varian Vista 6000 gas chromatograph equipped with autosampler, photo ionization detector (PID) and computerized controls and data processing. A 30 m DB5 narrow bore capillary column was installed in the HP 5880 and a 30 m DB1 narrow bore capillary column was installed in the Vista 6000.

Chromatographic parameters were varied as required by the volatility of the individual solutes.

The carrier gas used was nitrogen or hydrogen.

2.3.4.2 Preparation of Calibration Standards

Standards at 10, 25, and 50 mmoles/L concentration of each solute were prepared.

Solutions of the liquid solutes were prepared by injecting the proper amount of the solute by micro syringe into 1 mL solvent in an autosample vial.

Solutions of the solid solutes were prepared using a two step process. First, an amount of solute was weighed to make up a 250 mL, 50 mmole/L solution. The stock solution was either analysed as is or, diluted by introducing an aliquot of solutions and then solvent into an autosampler vial to make up a total of 1 mL, and then analyzed.

The calibration standards in the autosampler vials were stored in a freezer until analysis.

2.3.4.3 Estimates of Analytical Error

Six identical calibration standards at 10, 25, and 50 mmoles/L concentration of dibenzylamine in cyclohexane were prepared and analyzed. The statistical error estimates were carried out by "Standard Methods" (1985) No. 104 on the results of the six analyses.

At 10 mmoles/L, the relative standard deviation found was 12%, and at 25 and 50 mmoles/L, 2%.

All data fell within the 95% confidence limit.

2.4 Membrane Fabrication

Two sets of membranes were fabricated. The first set was used during the static cell tests. The second set was comprised of

the membranes that were compatible with the solvents during the static cell tests and were used during the continuous flow cell test. The second set of membranes were fabricated with loose and tight porosities.

The following outlines the general membrane fabrication procedure used here.

- i) All components of the formulation were combined and mixed on a ball mill for one to two weeks until a clear casting solution appeared. Mixing on the ball mill did not entrap air thus deaeration was not required.
- ii) The casting solution was poured on a glass plate and spread with a casting knife.
- iii) The casting solution was gelled in a water bath by immersion of the glass plate supporting the casting solution.
- iv) The membrane was peeled off the glass plate.
- v) If heat treatment was required, then the membrane was placed in a water bath at the desired temperature.
- vi) The membrane was placed in 50% isopropanol-water solution for preservation until use.

The above procedure was adjusted to meet the requirements of each membrane. The formulation and casting conditions for each membrane are listed in Table 2-1. The membranes for the static cell tests were not treated (heat or evaporation) to modify porosity. For the continuous flow cell tests, both modified and unmodified membranes were used. The designations, porosity, and modifying conditions for these membranes are listed in Table 2-2.

TABLE 2-1

MEMBRANE FABRICATION CONDITIONS

i) Cellulose Acetate (CA) Membranes

Formulation:

Cellulose Acetate : 17.0%
Acetone : 69.2%
Magnesium Perchlorate : 1.45%
Water (RO/DI) : 12.35%

Casting Conditions:

Film Thickness : 0.254 mm
Casting Temperature : room
Casting Period : 1 minute
Evaporation Time : 1 minute
Gelation Bath : RO/DI water
Gelation Temperature : 4°C
Gelation period : 1 hour
Heat Treatment : 88°C for 10 minutes

ii) Cellulose Triacetate (CTA) Membranes

Formulation:

Cellulose Triacetate : 10.0%
Dichloromethane : 70.0%
Magnesium Perchlorate : 6.0%
Methanol : 14.0%

Casting Conditions:

Film Thickness : 0.254 mm
Casting Temperature : room
Casting Period : 30 seconds
Evaporation Time : 30 seconds
Gelation Bath : methanol
Gelation Temperature : 20°C
Gelation period : 15 minutes
Heat Treatment : 18°C for 1 hour

iii) Cellulose Nitrate (CN) Membranes

Formulation:

Cellulose Nitrate : 17.0%
Acetone : 69.2%
Magnesium Perchlorate : 1.45%
Water (RO/DI) : 12.35%

Casting Conditions:

Film Thickness : 0.254 mm
Casting Temperature : room
Casting Period : 1 minute
Evaporation Time : 1 minute
Gelation Bath : RO/DI water
Gelation Temperature : 3°C
Gelation period : 1 hour
Heat Treatment : 88°C for 10 minutes

iv) Cellulose Acetate Butyrate (CAB) Membranes

Formulation:

CAB : 25%
Acetone : 50%
Formamide : 17.5%
Maleic Acid : 7.5%

Casting Conditions:

Film Thickness : 0.254 mm
Casting Temperature : room
Casting Period : 3 minutes
Evaporation Time : 3 minutes
Gelation Bath : RO/DI water
Gelation Temperature : 3°C
Gelation period : 3 hours
Heat Treatment : 90°C for 3 minutes

v) Polyacryl Nitrile (PAN) Membranes

Formulation:

PAN : 18%
DMSO : 17%
Acetone : 25%

Casting Conditions:

Film Thickness : 0.254 mm
Preheat : 72°C for 1 hour
Casting Temperature : room
Casting Period : 30 seconds
Evaporation Time : 30 seconds
Gelation Bath : RO/DI water
Gelation Temperature : 8°C
Gelation period : 2 hours
Heat Treatment : 55°C for 3 minutes

TABLE 2-2

MEMBRANES USED FOR THE CONTINUOUS FLOW CELL TESTS

Polymer	Membrane Designation	Porosity	Modifying Condition
CTA	CTA1	tight	evaporation period : 30 seconds
CTA	CTA2	loose	evaporation period : 5 seconds
CAB	CAB1	tight	heat treatment : 90°C for 3 minutes
CAB	CAB2	loose	none
PAN	PAN1	tight	heat treatment : 55°C for 3 minutes
PAN	PAN2 or PAN3	loose	none

2.5 Mass Transfer Characteristics of Test Cells:

Determination of Solvent Feed Flow Rates

The operating pressure, feed flowrate, and temperature specified by EMR for salt flux test with cellulose acetate membrane was 3500 kPag (500 psig), 750 cc/min. and 25°C respectively. The salt concentration was 3500 mg/L NaCl. The CA membrane was supplied by Desalination Systems Inc. (Escondido, CA).

The purpose of the salt flux test was to determine the mass transfer characteristics of the NRC type cell (NRC drawing C-1123-1, dated June 23, 1977) and the parameters to vary when running with organic solvents to maintain similar hydraulic conditions as with water.

The calculations done for cell No. 1 are shown here. The calculations followed Kimura and Sourirajan (1968), Agarwal and Sourirajan (1969) and Farnand (1983). The constants in these calculations were obtained from the above publications and the "Handbook of Chemistry and Physics" (1984).

Fixed parameters for calculations:

P = 34.02 atm
PWP = 60.6445 g/hr
 π = 2.61 atm
C = 5.535×10^{-2} gmoles/cc
 v = 0.8963×10^{-2} cm²/sec
D = 1.505×10^{-5} cm²/sec
d = 4.115 cm
membrane area : 13.3 cm²
Q = 750 cc/min
 x_{A3} = 5.37×10^{-5}
 x_{A1} = 9.31×10^{-4}
 ρ = .94
 N_B = 6.864×10^{-5} g.mole/sec-cm²

Calculations:

$$\begin{aligned}
 \text{i) } A &= \frac{PWP}{M_w \times 13.3 \times 3600 \times P} \\
 &= \frac{60.6445}{18 \times 13.3 \times 3600 \times 34.02} \\
 &= 2.0682 \times 10^{-6} \text{ g.mol/cm}^2\text{-sec-atm}
 \end{aligned}$$

$$\begin{aligned}
 \text{ii) } x_{A2} : N_B &= A[P - \pi(x_{A2}) + \pi(x_{A3})] \\
 x_{A2} &= \frac{\frac{-N_B}{A} + P + \pi(x_{A3})}{\pi} \\
 &= \frac{\frac{6.864 \times 10^{-5}}{2.0682 \times 10^{-6}} + 34.02 + 2.61 (5.37 \times 10^{-5})}{2.61} \\
 &= 0.320
 \end{aligned}$$

$$\begin{aligned}
 \text{iii) } \frac{D_{AM}}{K\delta} : N_B &= \left(\frac{D_{AM}}{K\delta} \right) \left(\frac{1 - x_{A3}}{x_{A3}} \right) (x_{A2} - x_{A3}) c \\
 \frac{D_{AM}}{K\delta} &= \frac{N_B x_{A3}}{c(1 - x_{A3})(x_{A2} - x_{A3})} \\
 &= \frac{(6.864 \times 10^{-5})(5.37 \times 10^{-5})}{(5.535 \times 10^{-2})(1 - 5.37 \times 10^{-5})(.320 - 5.37 \times 10^{-5})} \\
 &= 2.081 \times 10^{-7} \text{ cm/sec}
 \end{aligned}$$

$$\begin{aligned}
 \text{iv) } k : N_B &= \frac{kc(1 - x_{A3}) \ln \left(\frac{x_{A2} - x_{A3}}{x_{A1} - x_{A3}} \right)}{k} \\
 k &= \frac{N_B}{c(1 - x_{A3}) \ln \left(\frac{.320 - 5.37 \times 10^{-5}}{9.31 \times 10^{-4} - 5.37 \times 10^{-5}} \right)}
 \end{aligned}$$

$$= 2.10 \times 10^{-5} \text{ cm/sec}$$

v)

$$\begin{aligned} \frac{N_{Sh}}{N_{Sc}^{1/3}} &= \frac{kd/D}{(v/D)^{1/3}} \\ &= \frac{(2.10 \times 10^{-5})(4.115)}{1.505 \times 10^{-5}} \\ &= \frac{\left(\frac{0.8963 \times 10^{-2}}{1.505 \times 10^{-5}} \right)^{1/3}}{1} \\ &= 0.70 \end{aligned}$$

vi)

$$N_{Re} = \frac{LV\rho}{\mu}$$

for NRC test cell (NRC drawing C-1123-1 dated June 23, 19877)

$$L = \frac{2ab}{a + b}$$

where: a = width of channels at the edge
 $= \pi d = \pi(4.159) = 13.066 \text{ cm}$
 b = height of channel at the edge
 $= 0.0635 \text{ cm}$

$$\begin{aligned} L &= \frac{2(13.066)(0.0635)}{13.066 + 0.0635} \\ &= 0.1264 \text{ cm} = 1.264 \times 10^{-3} \text{ m} \end{aligned}$$

$$\begin{aligned} V &= \frac{Q}{A} = \frac{750}{(13.066)(.0635)} \\ &= 903.95 \text{ cm/min} = 15.07 \text{ cm/sec} \\ &= 0.1507 \text{ m/sec} \end{aligned}$$

$$\frac{\rho}{\mu} = 10^6 \text{ sec/m}^2$$

$$\begin{aligned} N_{Re} &= (1.264 \times 10^{-3})(0.1507)(10^6) \\ &= 195 \end{aligned}$$

To maintain identical hydraulic conditions in the cells with organic solvents as with water

$$\frac{N_{Sh}}{N_{Sc}^{1/3}} = \text{constant and } N_{Re} = 195$$

Therefore, $\frac{V_s}{V_w} = \frac{\nu_s}{\nu_w}$ and

$$V_s = \frac{V_w \nu_s}{\nu_w}$$

where V_s = solvent flowrate
 V_w = water flowrate
 ν_s = kinematic viscosity of the solvent and
 ν_w = kinematic viscosity of the water

At the operating temperature of 25°C the viscosity, density, kinematic viscosity, and the required flowrate to maintain $N_{Re} = 195$ are listed in Table 2-3.

TABLE 2-3

SOLVENT HYDRAULIC PARAMETERS TO MAINTAIN

<u>Solvent</u>	$N_{Re} = 195.$			Recirc. Rate cc/min
	μ poise	ρ g/cc	v cm ² /sec	
Water	0.0089	0.9971	0.0090	750
Heptane	0.0039	0.6780	0.0058	483
Toluene	0.0057	0.8635	0.0060	500
Cyclohexane	0.009	0.7791	0.0116	966

3.0 RESULTS

The data collected for the mass transfer characterization of the test cells is presented in Appendix A. The data collected during the organic solute separation tests is presented in Appendices B, C, and D.

In the following sections, a brief commentary will be provided on the trends and some observations not evident in the data. Under this contract, ZENON's mandate was to generate the data, not interpret it.

3.1 Mass Transfer Characteristics of the Test Cells

The mass transfer coefficients of cell number 1 were calculated in Section 2.5. The data for every cell is presented in Appendix A.

At a feed flow of 750 mL/minute (for water), specified by the Scientific Authority, the Reynolds number of the cell is 195. This Reynolds number cannot be considered to be accurate since the shape or hydraulic radius of the cell is poorly defined. Nevertheless, the hydraulic conditions fall into the laminar region. Experience in running reverse osmosis separation tests shows that optimum product rate and separation is not obtained in the laminar but in the turbulent ($N_{Re} > 2000$) flow region.

A k (mass transfer coefficient) of 2.10×10^{-5} cm/sec and $N_{Sh}/(N_{Sc})^{.33}$ of 0.70 were obtained. These values are substantially lower than values obtained by Agarwal and Sourirajan (1969) and Kimura and Sourirajan (1968) at a N_{Re} of 195. To explain this deviation, one must consider that the test cell used by these authors was very

different from the one used in this study and, while cellulose acetate membranes used in the present study were commercially produced for the referenced studies, the membranes were fabricated by the authors nearly 17 years prior to this work. These two situations signify that the results obtained in this study and the published works do not need to correlate.

Subsequently, the mass transfer coefficient obtained for a cell with CA membrane and salt solutions cannot be applied to cells housing unique experimental membranes operating with organic solute/solvent solutions. It was, however, possible to maintain the identical Reynolds number when the solvents were changed in the test systems. The operating flow rates for the respective solvent runs are listed in Table 2-3.

3.2 Static Cell Tests

Membranes were fabricated from five polymers. The polymers were CAB, CTA, CA, CN, and PAN.

The static tests were carried out in a cell manufactured by Millipore (loaned by the Scientific Authority). The schematic diagram of the set up is shown in Figure 2-1.

The results are listed in Table 3-1. The criteria for membrane suitability were:

- i) reasonable flux (as compared with water flux on established membranes) obtained with each solvent,
- ii) maintenance of the flux over a period of 3 to 4 weeks, and
- iii) maintenance of membrane integrity.

TABLE 3-1
STATIC CELL TEST DATA

Membrane Type	Solvent	Days	Permeate Flow Rate - mL/min			
			1	15	21	28
CAB	Toluene		0.16	N/A	0.26	0.30
	Heptane		0.04	N/A	0.0	0.0
	Cyclohexane		0.0	N/A	0.0	0.0
CTA	Toluene		0.55	N/A	0.48	0.39
	Heptane		0.68	N/A	0.82	0.77
	Cyclohexane		0.15	N/A	0.17	0.28
CA	Toluene		L	N/A	0.0	0.0
	Heptane		0	N/A	0.0	10.16
	Cyclohexane		0	N/A	0.0	0.0
CN	Toluene		D	N/A	D	D
	Heptane		0	N/A	MF	0
	Cyclohexane		0	N/A	0	MF
PAN	Toluene		N/A	0.36	0.57	N/A
	Heptane		N/A	1.15	1.65	N/A
	Cyclohexane		N/A	MF	0.13	N/A

N/A : Not Available

L : Leak

D : Dissolved

MF : Membrane Faulty

Membrane failure could be considered as membrane dissolution in the solvent, membrane swelling resulting in no flux, and membrane cracking resulting in excessive flux.

The static tests showed that only CTA and PAN met all the criteria for membrane suitability. The CN dissolved in toluene and did not pass the other solvents. CAB passed toluene, barely passed heptane, and did not pass cyclohexane. CA did not pass toluene or cyclohexane and showed a slight passage of heptane even though it is difficult to state whether it was flow through the pores or flow through fault sites.

A number of the membranes showed fault sites, probably due to membrane casting irreproducibility. In one case, the membrane was placed into the cell incorrectly and therefore showed excessively high flux.

For the reverse osmosis testing, CTA and PAN membranes were used.

Even though they did not meet all the test criteria, the CAB membranes were chosen as the third set.

The membranes of cellulose (CE) and polyether imide (PEI) posed severe fabrication problems that were not solved and thus could not be tested.

3.3 Reverse Osmosis Separation Runs With Organic Solute/Solvent Matrices

3.3.1 Overall Observations

Reverse osmosis separation tests of 37 organic solutes in 3 organic solvents were run. The solutes and solvents used are listed

in Table 3-2. The runs were conducted at pressures of 3450 kPag (500 psig) and 6900 kPag (1000 psig). The recirculation flowrates used with each solvent system are listed in Table 2-3. The membranes' properties are listed in Table 2-2 and fabrication procedures in Table 2-1.

The data collected during these runs are presented in Appendices B, C, and D.

Overall, solute rejections ranged from about -200% to about 100%. However, in nearly all runs, no substantial solute rejection was observed. Pressure and membrane type did not seem to have any appreciable affect on rejections. However, the pure solvent flux was at least twice as high at 6900 kPag (1000 psig) than at 3450 kPag (500 psig) and varied considerably among the membranes.

The significance of membrane performance must be viewed in light of the experimental error. Six replicates at 3 concentrations of dibenzylamine in cyclohexane were analyzed to determine the analytical error. The error analysis was carried out according to Method 104 of "Standard Methods". The relative analytical error at 10 mmole concentration was $\pm 12\%$, and at 25 and 50 mmolar concentration $\pm 2\%$. All data fell within the 95% confidence limit.

The test operating error was estimated to be about $\pm 30\%$ etc. The error was contributed by feed preparation, flow measurements, pressure measurements, sampling, and sample handling.

The total error could be as high as $\pm 42\%$. Experience in running reverse osmosis tests indicates that error of this magnitude is not unusual and error encountered here might be on the lower end of the observed range.

TABLE 3-2

LIST OF SOLUTE/SOLVENT MATRICIES STUDIED

No.	Solute/Solvent	Toluene	Heptane	Cyclohexane
1	benzene	R	R	R
2	ethylbenzene	R	R	R
3	p-xylene	R	R	R
4	cumene	R	R	R
5	mesitylene	R	R	R
6	biphenyl	R	R	R
7	toluene		R	R
8	n-propylbenzene	R	R	R
9	n-butylbenzene	R	R	R
10	naphthalene	R	R	R
11	β - methyl naphthalene	R	R	R
12	n-pentane	R	R	R
13	n-heptane	R		R
14	n-hexane	R	i	R
15	2,2-dimethylbutane	R	R	R
16	hexadecane	R	R	R
17	isooctane	R	R	R
18	1-hexene	R	R	R
19	1-nonene	R	R	R
20	cyclohexane	R	R	
21	methylcyclohexane	R	R	R
22	cyclopentane	ND	R	R
23	carbazole	i	i	i
24	aniline	R	i	NM
25	n-octylamine	R	R	R
26	dibenzylamine	R	R	R
27	pyridine	ND	R	R
28	1-decanethiol	ND	R	R
29	benzothiophene	R	R	R
30	dibenzothiophene	R	R	R
31	phenol	R	R	R
32	o-cresol	R	R	R
33	p-cresol	R	R	R
34	methanol	R	R	i
35	xylene (mixed)	R	R	R
36	polyethylene glycol	R	NC	NC
37	triethylamine	R	NC	NC

R : run

ND : not detectable in the matrix

NC : not chromatographable in the matrix

NM : not miscible in the solvent

i : insoluble in the solvent

Some solvent, solute, and membrane interactions were observed. During run 8 with heptane (solvent), the membrane CAB1 stopped permeating and never recovered. This membrane failure was judged to be a solvent effect and the membrane was not replaced. During the run with phenol (solute), the flux through all membranes either stopped or drastically slowed and the membranes had to be replaced.

The solvent cyclohexane had the most drastic effect upon the membranes. During the first 24 runs, CTA1, PAN1, and PAN3 did not permeate. After run 24, PAN1 and PAN3 returned to normal. CTA1 never recovered. The solute decanethiol caused the flux through CAB1 and CAB2 to decline. The flux did not return through the pure solvent permeation runs and rinsing. However, over the next 12 runs, the flux returned to nearly normal.

No problems were encountered during the runs with toluene.

3.3.2 Results of Methanol Separation Runs

The separation of methanol from organic matrix was of special interest as this data predicts what can be expected for methanol removal from fuel mixtures in an upcoming application. In the fuel mixtures, the concentration of methanol is expected to be about 3% to 5%. The removal of the methanol selectively through the membrane would be advantageous as smaller volumes would need to pass through the membrane. In this study, all the membranes preferentially passed methanol from heptane (see Appendix B), and four out of six membranes passed methanol from toluene, at 6900 kPag feed pressures. Rejections ranged from -5% to about -200%. CTA seemed to pass

methanol more than the other membranes tested. At 3450 kPag, the rejection trend was not as clear. With the loose CTA membrane, a greater negative rejection of methanol was obtained at 6900 kPag than at 3450 kPag. Due to the error encountered during the runs at this time, it is prudent to identify only the trends in the data.

4.0 RECOMMENDATIONS

The work conducted during this project provided three recommendations for future work.

First, the mass transfer calculations from the salt runs showed that the present "NRC" cells are ill defined hydraulically and that the flow region is in the laminar range, which is inadequate for the separation work carried out. During the project, ZENON built a test cell that generates a simple well defined flow pattern with a membrane area that is four times as large as the membrane area of the "NRC" cells. This large test cell is operated in the turbulent flow region. The salt runs and the mass transfer calculations should be conducted with this cell using varying feed pressures and flowrates.

Secondly, once the mass transfer characteristics of the large test cell are determined, separation of a selected number of organic solutes from organic solvent should be run.

Finally, the large test cell should be used for all future work since it's performance best approximates the performance of the commercially available reverse osmosis membrane modules.

REFERENCES

- Agarwal, J.P. and Sourirajan, S. (1969). "Specification, Selectivity and Performance of Porous Cellulose Acetate Membranes in Reverse Osmosis." I & EC Process Design and Development 8, (4), 445.
- Farnand, B.A. (1983). "A Study of Reverse Osmosis Separation Involving Nonaqueous Solutions". Ph.D. Thesis, University of Ottawa. Ottawa, Ontario.
- Handbook of Chemistry and Physics, 64th edition, (1983-1984). The Chemical Rubber Co. Cleveland, Ohio.
- Kimura, S. and Sourirajan, S. (1968). "Performance of Porous Cellulose Acetate Membranes During Extended Continuous Operation Under Pressure in the Reverse Osmosis Process Using Aqueous Solutions". I & EC Process Design and Development, 7, (2), 197.
- Standard Methods for the Examination of Water and Wastewater. (1985), 16th edition, ALPHA, AWWA, WPCF.

APPENDIX A

SALT SEPARATION TEST DATA

RUN NO. - PURE WATER

[illegible]

ENR - HEPTANE, TOLUENE PROJECT

SYSTEM TEMP. (avg.) - 26.25 C
WORKING PRESSURE 500 PSI

5200 uhaos/ca

RUN NO. -
DATE -

SALT TEST #1

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	7.0000	8.0000	9.0000	10.0000	11.0000	12.0000
MEMBRANE TYPE	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA
SAMPLE TIME (min.)	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000
BOTTLE WEIGHT (grams)	19.1366	19.3646	19.1694	19.3081	19.3832	19.5052	19.5208	19.1554	19.3674	19.1794	19.7221	19.4999
BOTTLE+SAMPLE WEIGHT (grams)	33.5560	33.0711	34.1564	33.6570	31.4111	33.1221	37.7984	38.8827	38.8841	40.5961	28.6541	38.9831
SAMPLE WEIGHT (grams)	14.4194	15.7045	14.9870	14.3489	12.0279	13.6169	18.2776	19.7273	19.5167	21.4167	8.9320	19.4832
PERMEATE RATE (gr./hr.)	57.6776	62.8260	59.9480	57.3956	48.1116	54.4676	73.1104	78.9092	78.0688	85.6668	35.7280	77.9328
PERMEATE RATE 25 C	56.0972	61.1046	58.3854	55.8230	46.7933	52.9752	71.1072	76.7471	75.9278	83.3195	34.7491	75.7974
PERMEATE CONDUCTIVITY (uhaos/cc)	365	520	430	560	400	490	700	740	830	1030	5200	940
SOLUTE REJECTION %	93	90	92	89	92	91	87	85	84	80	0	82

EMR - HEPTANE, TOLUENE PROJECT

5200 ulmoos/cm

FEED CONDUCTIVITY

SYSTEM TEMP. (avg.) - 26.25 C
WORKING PRESSURE 500 PSI

RUN NO. - SALT TEST #2
DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	7.0000	8.0000	9.0000	10.0000	11.0000	12.0000
MEMBRANE TYPE	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA
SAMPLE TYPE	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000
SAMPLE TIME (min.)												
BOTTLE WEIGHT (grams)	19.6386	19.4142	19.1503	19.3438	19.3613	19.4790	19.3884	19.2788	19.5440	19.4873	19.5667	19.5070
BOTTLE+SAMPLE WEIGHT (grams)	33.3740	34.3713	33.4183	33.0251	30.8825	32.3863	36.6738	37.9208	38.0661	39.7358	27.7675	37.9691
SAMPLE WEIGHT (grams)	13.7354	14.9571	14.2680	13.6613	11.5212	12.9073	17.2854	18.6420	18.5201	20.2485	8.2008	18.4621
PERMEATE RATE (gr./hr.)	54.9416	59.8284	57.0720	54.6452	46.0848	51.6292	69.1416	74.5680	74.0804	80.9940	32.8032	73.8484
PERMEATE RATE 25 C	53.4362	58.1891	55.5982	53.1479	44.8221	50.2146	67.2471	72.5248	72.0506	78.7748	31.9044	71.8250
PERMEATE CONDUCTIVITY (ulmoos/cm)	400	520	450	560	430	490	695	765	850	1100	5200	970
SOLUTE REJECTION	92	90	91	89	92	91	87	85	84	79	0	81

EMS - HEPTANE, TOLUENE PROJECT

SEAL GRADES 1-4

FEED CONDUCTIVITY

SYSTEM TEMP. (avg.) - 27 C
WORKING PRESSURE 500 PSI

RUN NO. -
DATE -

SALT TEST #3

CELL #	1	2	3	4	5	6	7	8	9	10	11	12
PERMEATE TYPE	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA
SAMPLE TIME (min.)	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000
BOTTLE WEIGHT (grams)	22.1069	22.3307	22.5329	22.1703	22.4429	22.3707	22.2783	21.9488	22.2885	21.9778	22.1739	22.6434
BOTTLE+SAMPLE WEIGHT (grams)	39.8269	42.4557	41.9942	40.9907	38.6136	39.6929	46.7112	46.4807	47.1560	46.7098	31.0283	47.8766
SP. GR.	17.7200	20.1290	19.3613	18.7304	16.1707	17.3222	24.4329	24.3319	24.8675	24.7320	8.8544	25.2332
PERMEATE RATE (gr./hr.)	70.8800	80.3160	77.4452	74.9216	64.6828	69.2888	97.7316	98.1276	99.4700	98.9280	35.4176	100.9328
PERMEATE RATE 25 C	67.8180	77.0377	74.0996	71.6850	61.8885	66.2955	93.5096	93.8885	95.1729	94.6543	33.8876	96.5725
PERMEATE CONDUCTIVITY (uMhos/cm)	350	475	440	500	405	400	690	780	900	1050	5400	870
% SOLUTE REJECTION	94	92	92	91	93	93	88	87	84	82	7	85

EMA - HEPTANE, TOLUENE PROJECT

SYSTEM TEMP. (avg.) - 19 C
WORKING PRESSURE 500 PSI

FEED CONDUCTIVITY 5600 uohms/cm

RUN NO. - SALT TEST #4

DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	7.0000	8.0000	9.0000	10.0000	11.0000	12.0000
MEMBRANE TYPE	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA
SAMPLE TIME (min.)	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000
BOTTLE WEIGHT (grams)	22.3049	22.3654	22.2391	22.3265	22.4336	22.2081	22.1927	22.4317	22.1475	22.4079	22.4048	22.0924
BOTTLE+SAMPLE WEIGHT (grams)	36.6417	38.6665	37.8829	37.4857	35.5200	36.2398	41.3943	42.9739	43.0473	44.7540	28.8761	43.0660
SAMPLE WEIGHT (grams)	14.3368	16.3011	15.6438	15.1592	13.0864	14.0317	19.2016	20.5422	20.9000	22.3461	6.4713	20.9676
PERMEATE RATE (gr./hr.)	57.3472	65.2044	62.5752	60.6368	52.3456	56.1268	76.8064	82.1688	83.6000	89.3844	25.8652	83.8704
PERMEATE RATE 25 C	65.9665	75.0046	71.9803	69.7505	60.2131	64.5627	88.7504	94.5188	96.1651	102.8189	29.7757	96.4761
PERMEATE CONDUCTIVITY (uohms/cm)	340	465	430	490	390	390	680	755	840	980	5300	850
I SOLUTE REJECTION	94	92	93	92	93	93	88	87	86	83	9	85

ENR - HEPTANE, TOLUENE PROJECT

SYSTEM TEMP. (avg.) - 23.5 C
WORKING PRESSURE 500 PSI

RUN NO. - SALT TEST #5
DATE-

FEED CONDUCTIVITY 6400 uhaos/cm

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	7.0000	8.0000	9.0000	10.0000	11.0000	12.0000
RENAME TYPE	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA
SAMPLE TIME (min.)	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000	15.0000
BOTTLE WEIGHT (grams)	22.3878	22.5702	22.5284	22.2081	22.5116	22.4270	22.0482	22.1320	22.1953	22.2811	22.3178	22.4229
BOTTLE+SAMPLE WEIGHT (grams)	37.3349	39.3463	38.4270	37.7925	35.9834	36.8421	41.5286	42.9441	43.4160	44.8282	48.5946	43.5452
SAMPLE WEIGHT (grams)	14.9491	16.7761	16.8986	15.5844	13.4718	14.4151	19.4804	20.8121	21.2207	22.5471	6.2768	21.1223
ENR/GATE RATE (gr./hr.)	59.7964	67.1844	64.3944	62.3376	53.8872	57.4604	77.9216	83.2484	84.8828	90.1884	25.1072	84.4892
ENR/GATE RATE 25 C	61.8713	69.5157	66.4289	64.5607	55.7571	59.4612	80.6255	86.1371	87.8282	93.3179	25.9784	87.4210
ENR/GATE PRODUCTIVITY Absolute	358	440	430	500	390	390	730	815	900	1400	5800	945
RELUTE SECTION	95	93	93	92	94	94	89	87	86	78	9	85

APPENDIX B
HEPTANE TEST DATA

EHR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 25 C

PHASE- HEPTANE
RUN NO.- 1
DATE- 31/1/86

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE 2
RUN NO.-
DATE- 31/1/86
PRODUCT RUN BENZENE
CONC. (MMOLAR) 995
INITIAL FEED CONC. (MMOLAR)-
FINAL FEED CONC. (MMOLAR)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	66.0000	7.0000	7.0000	1.0000	4.0000
BOTTLE WEIGHT (grams)	22.2787	22.3054	21.7407	22.4215	21.8527	22.6735
BOTTLE+SAMPLE WEIGHT (grams)	34.0751	25.9986	33.3324	31.8615	29.4974	27.3985
SAMPLE WEIGHT (grams)	11.7964	3.6932	11.5717	9.4400	7.6447	4.7230
PERMEATE RATE (gr./hr.)	176.9440	3.3575	99.1840	81.0857	450.4820	70.8450

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	18.0000	4.0000	5.0000	1.0000	5.0000
BOTTLE WEIGHT (grams)	22.1761	22.3977	22.4733	22.1380	22.3243	22.1773
BOTTLE+SAMPLE WEIGHT (grams)	33.8940	23.5158	29.1818	29.0435	29.9952	28.2916
SAMPLE WEIGHT (grams)	11.7179	1.1181	6.7085	6.9055	7.6709	6.1143
PERMEATE RATE (gr./hr.)	175.7685	3.7270	100.4275	82.8440	440.2540	73.3716
SOLUTE CONC. IN PERMEATE	1019	1129	1045	1055	1090	1118
SOLUTE REJECTION	-2	-13	-7	-6	-10	-12

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 3
 DATE- 31/1/86

PRODUCT RUN BENZENE
 CONC.(MOL/LR)

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-
 995 INITIAL FEED CONC. (F1)-
 FINAL FEED CONC. (F2)-

1000 PSI
 25 C
 984
 1005

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
 RUN NO.-
 DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1

SAMPLE TIME (min.)	2.0000	21.8044	34.4823	12.6779	1078	2
BOTTLE WEIGHT (grams)	16.0000	21.7744	23.4363	1.6619	1394	SOLUTE REJECTION

BOTTLE WEIGHT (grams)	22.2643	22.7918	22.3543	22.2918	203.6580	-3
BOTTLE+SAMPLE WEIGHT (grams)	32.4472	35.5312	29.6303	33.5312	873.1200	-2

SAMPLE WEIGHT (grams)	10.1829	11.2394	7.2760	9.6540	115.8480	-40
PERMEATE RATE (gr./hr.)	1016	1043	1062	1164	-7	-17

PERMEATE RATE (gr./hr.)	115.8480	1164	-7	-17
SOLUTE CONC. IN PERMEATE	-3	-2	-5	-17

SOLUTE CONC. IN PERMEATE	-3	-2	-5	-17
SOLUTE REJECTION	-3	-2	-5	-17

EMR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 4
DATE- 3/2/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000	16.0000	4.0000	5.0000	1.0000	8.0000
BOTTLE WEIGHT (grams)	21.7679	22.1999	22.5999	21.9764	22.4240	21.8334
BOTTLE+SAMPLE WEIGHT (grams)	35.5554	23.1452	36.3305	37.1709	36.4456	32.7607
SAMPLE WEIGHT (grams)	13.7875	0.9453	13.7306	15.1945	14.0216	10.9273
PERMEATE RATE (gr./hr.)	413.6250	3.5449	205.9590	182.3340	841.2960	81.9548

EMR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 5
DATE- 3/2/86

WORKING PRESSURE- 1000 P
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

PRODUCT RUN METHANOL
CONC. (MMOLAR) 10

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000	15.0000	4.0000	5.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	22.3015	22.1226	21.9998	22.5632	21.9864	22.4848
BOTTLE+SAMPLE WEIGHT (grams)	35.4082	23.2797	34.9200	36.0870	34.9597	31.5889
SAMPLE WEIGHT (grams)	13.1067	1.1571	12.9202	13.5238	12.9733	9.1041
PERMEATE RATE (gr./hr.)	393.2010	4.6284	193.8030	162.2856	778.3980	91.0410
SOLUTE CONC. IN PERMEATE	12	12	34	12	12	15
% SOLUTE REJECTION	-20	-20	-240	-20	-20	-50

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 6
DATE- 3/2/86

PHASE- HEPTANE
RUN NO.- 7
DATE- 3/2/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C
10 INITIAL FEED CONC. (F1)- 0
FINAL FEED CONC. (F2)- 12

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	2.0000	15.0000	4.0000	5.0000	1.0000	6.0000	SAMPLE TIME (min.)	3.0000		5.0000	6.0000	1.0000	7.0000
BOTTLE WEIGHT (grams)	22.3015	22.1226	21.9998	22.5632	21.9864	22.4848	BOTTLE WEIGHT (grams)	22.0915		22.4130	22.7225	22.9839	21.9147
BOTTLE+SAMPLE WEIGHT (grams)	35.4082	23.2797	34.9200	36.0870	34.9597	31.5889	BOTTLE+SAMPLE WEIGHT (grams)	31.9804		31.0379	30.5183	29.2539	27.8116
SAMPLE WEIGHT (grams)	13.1067	1.1571	12.9202	13.5238	12.9733	9.1041	SAMPLE WEIGHT (grams)	9.8889		8.6249	7.7958	6.2700	5.8969
PERMEATE RATE (gr./hr.)	393.2010	4.6284	193.8030	162.2856	778.3980	91.0410	PERMEATE RATE (gr./hr.)	197.7780		103.4988	77.9580	376.2000	50.5449
SOLUTE CONC. IN PERMEATE	12	0	12	15	12	8							
SOLUTE REJECTION	-20	100	-20	-50	-20	20							

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 8
DATE- 4/2/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 9
DATE- 4/2/86

PRODUCT RUN P-XYLENE
CONC. (MMOLAR) 38

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR) 38
FINAL FEED CONC. (MMOLAR) 3

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	5.0000	5.0000	6.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	22.5024	22.1644	22.2328	21.9603	21.8050	
BOTTLE+SAMPLE WEIGHT (grams)	32.1470	30.2369	30.3014	28.9200	26.7763	
SAMPLE WEIGHT (grams)	9.6446	8.1325	8.0686	6.9597	4.9713	
PERMEATE RATE (gr./hr.)	192.8920	97.5900	80.4860	416.3820	49.7130	

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.5000	4.0000	5.0000	1.0000	6.0000	
BOTTLE WEIGHT (grams)	22.1338	21.8994	22.4333	22.5496	22.1344	
BOTTLE+SAMPLE WEIGHT (grams)	33.8095	28.4315	29.2189	29.5077	27.1547	
SAMPLE WEIGHT (grams)	11.6757	6.5321	6.7836	6.9581	5.0203	
PERMEATE RATE (gr./hr.)	200.1549	97.9815	81.4032	417.4860	50.2030	
SOLUTE CONC. IN PERMEATE	38	38	38	38	40	
SOLUTE REJECTION	-3	0	0	0	-5	

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 10
 DATE- 4/2/86

PRODUCT RUN P-XYLENE
 CONC (MOLAR)

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)- 24.5 C
 38 INITIAL FEED CONC. (F1)-
 FINAL FEED CONC. (F2)-

1000 PSI
 37
 38

PURE SOLVENT RUN
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

PHASE-
 RUN NO.-
 DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA1	PAM3	PAM1	
SAMPLE TIME (min.)	1.5000		3.0000	4.0000	1.0000	5.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.4076		22.1284	21.5272	21.8558	22.7960	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	32.8606		32.2991	33.0597	33.1075	29.5103	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	10.2530		10.1707	11.5325	13.2517	6.7143	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	410.1200		203.4140	172.9875	795.1020	80.5716	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	37		38	38	38	41	SOLUTE CONC. IN PERMEATE						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 11
DATE- 4/2/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 12
DATE- 4/2/86

PRODUCT RUN ET-BENZENE
CONC. (MMOLAR) 35

WORKING PRESSURE- 1000 P
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CIA2	CIA1	PAN3	PAN1
SAMPLE TIME (min.)	1.5000		3.0000	4.0000	1.0000	5.0000
BOTTLE WEIGHT (grams)	21.9156		21.9277	22.2927	22.1284	22.4853
BOTTLE+SAMPLE WEIGHT (grams)	32.4057		32.1074	33.4434	34.4864	28.5205
SAMPLE WEIGHT (grams)	10.6901		10.1797	11.3567	12.3580	5.8352
PERMEATE RATE (gr./hr.)	427.6040		203.5940	170.2605	741.4800	70.0224
SOLUTE CONC. IN PERMEATE	35		35	35	35	39
% SOLUTE REJECTION	0		0	0	0	-11

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 13
 DATE- 4/2/66

PRODUCT RUN ET-BENZENE
 CONC.(MOLAR) 38 INITIAL FEED CONC. (F1)-
 FINAL FEED CONC. (F2)-

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)- 500 PSI
 24.5 C

PHASE-
 RUN NO.-
 DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

35 35

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAB2	CAB1	CTA1	PAN3	PAN1	
SAMPLE TIME (min.)	3.0000		4.0000	5.0000	1.0000	6.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.4675		22.1963	22.4332	22.8576	22.3820	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	31.9574		28.8928	29.1346	29.1370	26.3383	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	9.4899		6.6965	6.7014	6.2794	3.9533	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	189.7980		100.4475	80.4168	376.7640	39.5330	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	35		35	36	35	37	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0		0	-3	0	-6	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 14
DATE- 5/2/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 15
DATE- 5/2/86

PRODUCT RUN NESTYLENE
CONC. (MMOLAR) 30

WORKING PRESSURE- 500 PS
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	3.0000		4.0000	5.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	22.1938		21.9323	21.9400	21.5391	22.3515
BOTTLE+SAMPLE WEIGHT (grams)	31.7055		28.3258	28.6441	28.0344	26.6420
SAMPLE WEIGHT (grams)	8.5117		6.3935	6.7041	6.4953	4.2905
PERMEATE RATE (gr./hr.)	190.2340		95.7025	80.4492	389.7180	42.9050

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	3.0000		4.0000	5.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	22.1075		22.5357	22.8983	22.7894	22.3057
BOTTLE+SAMPLE WEIGHT (grams)	32.1400		29.1397	29.7567	29.5136	26.7353
SAMPLE WEIGHT (grams)	10.0325		6.6040	6.8584	6.7242	4.4296
PERMEATE RATE (gr./hr.)	200.6500		99.0600	82.3008	403.4520	44.2960
SOLUTE CONC. IN PERMEATE	30		30	31	30	30
SOLUTE REJECTION	0		0	-3	0	0

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 16
DATE- 5/2/86

PRODUCT RUN MESITYLENE
CONC.(MOLAR) 31
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

1000 PSI
25.5 C
31
30

ENR - HEPTANE, TOLUENE PROJECT

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CYAZ	CYAI	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CYAZ	CYAI	PAM3	PAM1
SAMPLE TIME (min.)	1.7500		3.0000	4.0000	1.0000	5.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (gr aas)	22.0600		22.5165	21.8718	22.2531	22.8594	BOTTLE WEIGHT (gr aas)						
BOTTLE+SAMPLE WEIGHT (gr aas)	34.2255		33.1325	33.4947	35.0067	28.8754	BOTTLE+SAMPLE WEIGHT (gr aas)						
SAMPLE WEIGHT (gr aas)	12.1655		10.6160	11.6229	12.7536	6.0160	SAMPLE WEIGHT (gr aas)						
PERMEATE RATE (gr./hr.)	417.1029		212.3200	174.3435	765.2160	72.1920	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	31		31	30	30	31	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0		0	3	3	0	SOLUTE REJECTION						

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 17
DATE- 5/2/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

WORKING PRESSURE- 1000 F
SYSTEM TEMP. (avg.)- 25.5 C
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR) -

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 18
DATE- 5/2/86

PRODUCT RUN CUMENE
CONC. (MMOLAR) 33

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PMK1
SAMPLE TIME (min.)	1.5000		3.0000	4.0000	1.0000	5.0000
BOTTLE WEIGHT (grams)	23.0085		22.6139	22.3497	21.7994	22.7476
BOTTLE+SAMPLE WEIGHT (grams)	33.2837		32.8775	33.6949	33.7769	28.2587
SAMPLE WEIGHT (grams)	10.2752		10.2636	11.3452	11.9775	5.5111
PERMEATE RATE (gr./hr.)	411.0080		205.2720	170.1780	718.6500	66.1332
SOLUTE CONC. IN PERMEATE	33		34	34	33	35
SOLUTE REJECTION	0		-3	-3	0	-6

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PMK1
SAMPLE TIME (min.)	1.5000		3.0000	4.0000	1.0000	5.0000
BOTTLE WEIGHT (grams)	23.0085		22.6139	22.3497	21.7994	22.7476
BOTTLE+SAMPLE WEIGHT (grams)	33.2837		32.8775	33.6949	33.7769	28.2587
SAMPLE WEIGHT (grams)	10.2752		10.2636	11.3452	11.9775	5.5111
PERMEATE RATE (gr./hr.)	411.0080		205.2720	170.1780	718.6500	66.1332
SOLUTE CONC. IN PERMEATE	33		34	34	33	35
SOLUTE REJECTION	0		-3	-3	0	-6

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

HEPTANE
19
5/2/86

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
33 INITIAL FEED CONC. (F1)-
33 FINAL FEED CONC. (F2)-

500 PSI
25.5 C

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CA82	CA81	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CA82	CA81	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000		6.0000	7.0000	1.0000	8.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.1757		22.3794	22.7596	22.2121	22.5083	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	34.6432		32.0136	32.0918	28.2915	27.5022	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	12.4675		9.6342	9.3322	6.0794	4.9939	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	187.0125		96.3420	79.9903	364.7640	37.4543	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	33		34	34	33	35	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0		-3	-3	0	-6	SOLUTE REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 20
DATE- 6/2/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 21
DATE- 6/2/86

PRODUCT RUN TOLUENE
CONC. (MMOLAR) 33
WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25.5 C
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

CELL #	MEMBRANE TYPE	1	2	3	4	5	6
CMR2	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	
SAMPLE TIME (min.)	3.0000	4.0000	5.0000	6.0000	1.0000	6.0000	
BOTTLE WEIGHT (grams)	22.1656	22.3399	22.0627	22.5073	22.8953		
BOTTLE+SAMPLE WEIGHT (grams)	31.4521	28.8271	28.6895	28.6355	26.8346		
SAMPLE WEIGHT (grams)	9.2865	6.4882	6.6268	6.1282	3.9393		
PERMEATE RATE (gr./hr.)	185.7300	97.3230	79.5216	367.6970	39.3930		
SOLUTE CONC. IN PERMEATE							
SOLUTE REJECTION							

CELL #	MEMBRANE TYPE	1	2	3	4	5	6
CAB2	CAB1	CTA2	CTA1	PAM3	PAM1		
SAMPLE TIME (min.)	3.0000	4.0000	5.0000	6.0000	1.0000	6.0000	
BOTTLE WEIGHT (grams)	22.0885	21.9856	22.2280	22.3753	21.9950		
BOTTLE+SAMPLE WEIGHT (grams)	32.0307	28.4993	28.9711	28.7075	26.2474		
SAMPLE WEIGHT (grams)	9.9422	6.5337	6.7431	6.3322	4.2524		
PERMEATE RATE (gr./hr.)	198.8440	98.0055	80.9172	379.9320	42.5240		
SOLUTE CONC. IN PERMEATE							
SOLUTE REJECTION							

END - HEPTANE, TOLUENE PROJECT

END - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 32
 DATE- 6/2/86
 WORKING PRESSURE- 1400 PSI
 SYSTEM TEMP. (avg.)- 25 C
 33 INITIAL FEED CONC. (F1)-
 FINAL FEED CONC. (F2)-
 PURE SOLVENT RUN
 NO. PRESSURE-
 SYSTEM TEMP. (avg.)-
 TEMP. CORR. FACTOR-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.5000		3.0000	4.0000	1.0000	5.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.0917		22.7853	21.9757	21.7639	22.2054	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	32.5334		33.2407	33.6509	34.0185	28.0037	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	10.4417		10.4554	11.6752	12.2546	5.7983	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	417.6480		209.1080	175.1280	735.2760	69.5796	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	34		35	35	35	35	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-3		-6	-6	-6	-6	SOLUTE REJECTION						

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 24
 DATE- 6/2/86

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25 C
 PRODUCT RUN N-PROPYL BENZENE
 CONC. (MMOLAR) 33

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 24.5 C
 INITIAL FEED CONC. (MMOLAR) 3
 FINAL FEED CONC. (MMOLAR) 3

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	1.0000	3.0000	4.0000	5.0000	6.0000	
BOTTLE WEIGHT (grams)	21.9539	22.4926	22.5165	22.6089	22.6289	
BOTTLE+SAMPLE WEIGHT (grams)	29.2672	32.9327	34.0641	28.1294	28.1081	
SAMPLE WEIGHT (grams)	7.3133	10.4401	11.5476	6.0405	5.4792	
PERMEATE RATE (gr./hr.)	438.7980	208.8020	173.2140	724.8600	65.7504	

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	1.5000	3.0000	4.0000	5.0000	6.0000	
BOTTLE WEIGHT (grams)	21.9286	22.1612	22.2720	22.4036	21.8842	
BOTTLE+SAMPLE WEIGHT (grams)	32.5404	32.4725	33.9215	28.4678	27.2770	
SAMPLE WEIGHT (grams)	10.6118	10.3113	11.6495	6.0442	5.3908	
PERMEATE RATE (gr./hr.)	424.4720	206.2240	174.7425	727.7040	64.6896	
SOLUTE CONC. IN PERMEATE	33	33	33	33	33	36
% SOLUTE REJECTION	0	0	0	0	0	-9

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE- 6/2/86

HEPTANE
25

PRODUCT RUN N-PROPYL BENZYL
CONC (MOLAL) 33

500 PSI
24.5 C

33

33

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (AVG.)-
TEMP. CORR. FACTOR-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PMH1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PMH1
SAMPLE TIME (min.)	3.5600		4.0000	5.0000	1.0000	6.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.0439		22.3034	21.8796	21.7653	22.5038	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	32.8367		28.6268	28.4971	27.6059	26.1245	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	10.7928		6.3236	6.6175	5.8406	3.6207	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	185.0194		94.8510	79.4100	350.4360	36.2070	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	33		33	34	33	35	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0		0	-3	0	-6	SOLUTE REJECTION						

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 26
DATE- 7/2/86

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 27
DATE- 7/2/86

WORKING PRESSURE- 500 PS
SYSTEM TEMP. (avg.)- 25.5 C
PRODUCT RUN N-PROPYL BENZENE
INITIAL FEED CONC. (MMOLAR) 44
FINAL FEED CONC. (MMOLAR)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	3.0660	4.0000	5.0000	6.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	22.4206	22.5395	22.3415	23.6235	22.5035	
BOTTLE+SAMPLE WEIGHT (grams)	31.5048	28.8763	28.9083	29.8915	26.1926	
SAMPLE WEIGHT (grams)	9.0842	6.3368	6.5668	6.2680	3.6891	
PERMEATE RATE (gr./hr.)	181.6840	95.0520	78.8016	376.0800	36.8910	
SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION						

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	3.0000	4.0000	5.0000	6.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	21.4691	22.5454	22.5169	21.9798	21.9509	
BOTTLE+SAMPLE WEIGHT (grams)	31.2662	29.0155	29.2899	28.3405	25.8474	
SAMPLE WEIGHT (grams)	9.7971	6.4701	6.7730	6.3807	3.8915	
PERMEATE RATE (gr./hr.)	195.9420	97.0515	81.2760	382.8420	38.9150	
SOLUTE CONC. IN PERMEATE	33	34	35	38	44	
SOLUTE REJECTION	25	23	20	14	0	

EPA - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 20
DATE- 7/2/84

PRODUCT RUN	N-BUTYL BENZESTYLENE TEMP. (AVG.)- CONC (MMOLAR)	WORKING PRESSURE- 33 INITIAL FEED CONC. (F1)- 33 FINAL FEED CONC. (F2)-	1000 PSI 25.5 C
1	0.000	33	33
2	0.000	33	33
3	0.000	33	33
4	0.000	33	33
5	0.000	33	33
6	0.000	33	33
7	0.000	33	33
8	0.000	33	33
9	0.000	33	33
10	0.000	33	33
11	0.000	33	33
12	0.000	33	33
13	0.000	33	33
14	0.000	33	33
15	0.000	33	33
16	0.000	33	33
17	0.000	33	33
18	0.000	33	33
19	0.000	33	33
20	0.000	33	33
21	0.000	33	33
22	0.000	33	33
23	0.000	33	33
24	0.000	33	33
25	0.000	33	33
26	0.000	33	33
27	0.000	33	33
28	0.000	33	33
29	0.000	33	33
30	0.000	33	33
31	0.000	33	33
32	0.000	33	33
33	0.000	33	33
34	0.000	33	33
35	0.000	33	33
36	0.000	33	33
37	0.000	33	33
38	0.000	33	33
39	0.000	33	33
40	0.000	33	33
41	0.000	33	33
42	0.000	33	33
43	0.000	33	33
44	0.000	33	33
45	0.000	33	33
46	0.000	33	33
47	0.000	33	33
48	0.000	33	33
49	0.000	33	33
50	0.000	33	33
51	0.000	33	33
52	0.000	33	33
53	0.000	33	33
54	0.000	33	33
55	0.000	33	33
56	0.000	33	33
57	0.000	33	33
58	0.000	33	33
59	0.000	33	33
60	0.000	33	33
61	0.000	33	33
62	0.000	33	33
63	0.000	33	33
64	0.000	33	33
65	0.000	33	33
66	0.000	33	33
67	0.000	33	33
68	0.000	33	33
69	0.000	33	33
70	0.000	33	33
71	0.000	33	33
72	0.000	33	33
73	0.000	33	33
74	0.000	33	33
75	0.000	33	33
76	0.000	33	33
77	0.000	33	33
78	0.000	33	33
79	0.000	33	33
80	0.000	33	33
81	0.000	33	33
82	0.000	33	33
83	0.000	33	33
84	0.000	33	33
85	0.000	33	33
86	0.000	33	33
87	0.000	33	33
88	0.000	33	33
89	0.000	33	33
90	0.000	33	33
91	0.000	33	33
92	0.000	33	33
93	0.000	33	33
94	0.000	33	33
95	0.000	33	33

EMR - HEPTANE, TOLUENE PROJECT

PHASE -
RUN NO. -
DATE -

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -
TEMP. CORR. FACTOR -

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE
SAMPLE TIME (min.)	1.5000		3.0000	4.0000	1.0000	5.0000	SAMPLE TIME (min.)
BOTTLE WEIGHT (grams)	22.9482		22.7548	21.9679	22.0615	22.5580	BOTTLE WEIGHT (grams)
BOTTLE+SAMPLE WEIGHT (grams)	32.9329		32.6257	33.1511	33.8153	27.8354	BOTTLE+SAMPLE WEIGHT (grams)
SAMPLE WEIGHT (grams)	9.9847		9.8769	11.1832	11.7538	5.2774	SAMPLE WEIGHT (grams)
PERMEATE RATE (gr./hr.)	399.3880		187.4180	167.7480	705.2280	63.3288	PERMEATE RATE (gr./hr.)
SOLUTE CONC. IN PERMEATE	33		33	33	33	33	SOLUTE CONC. IN PERMEATE
SOLUTE	0		0	0	0	-6	SOLUTE

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 31
 DATE- 7/2/86

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25.5 C
 INITIAL FEED CONC. (MMOLAR) - 28
 FINAL FEED CONC. (MMOLAR) -

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 31
 DATE- 7/2/86

PRODUCT RUN N-PENTANE
 CONC. (MMOLAR) 28

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 29
 DATE- 7/2/86

WORKING PRESSURE 1000 PSI
 SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	3.0000		4.0000	5.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	21.6762		22.1738	22.3236	22.4503	22.1754
BOTTLE+SAMPLE WEIGHT (grams)	31.3809		28.8450	28.1945	28.4337	25.6582
SAMPLE WEIGHT (grams)	9.7047		6.6712	6.8709	5.9834	3.4828
PERMEATE RATE (gr./hr.)	194.0940		100.0680	82.4500	359.0040	34.8280
SOLUTE CONC. IN PERMEATE	27		28	25	28	28
SOLUTE REJECTION	4		0	11	0	0

EMR - HEPTANE, TOLUENE PROJECT

PHASE -
RUN NO. -
DATE -

HEPTANE
30
7/2/86

1000 PSI
25 C
28
28

EMR - HEPTANE, TOLUENE PROJECT

PHASE -
RUN NO. -
DATE -

PURE SOLVENT RUN
WORKING PRESSURE -
SYSTEM TEMP. (AVG.) -
TEMP. CORR. FACTOR -

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	1.5000		3.0000	4.0000	1.0000	5.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.6253		22.5645	22.3168	22.4029	22.2137	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	32.9814		32.6840	33.6561	33.8279	27.1722	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	10.3561		10.1195	11.3393	11.4250	4.9585	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	414.2440		202.3900	170.0895	685.5000	59.5020	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	28		28	28	26	28	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0		0	0	7	0	SOLUTE REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 32
DATE- 10/2/86

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 24 C

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 33
DATE- 10/2/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24 C
INITIAL FEED CONC. (MMOLAR) -
FINAL FEED CONC. (MMOLAR) -

PRODUCT RUN NAPHTHALENE
CONC. (MMOLAR) 33

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	2.0000		3.0000	4.0000	1.0000	5.0000
BOTTLE WEIGHT (grams)	22.7125		22.2489	22.4054	22.1401	22.1224
BOTTLE+SAMPLE WEIGHT (grams)	29.5264		27.0039	27.7952	28.0128	25.2151
SAMPLE WEIGHT (grams)	6.6139		4.7550	5.3098	5.8727	3.0927
PERMEATE RATE (gr./hr.)	198.4170		95.1000	79.6470	352.3620	37.1124
SOLUTE CONC. IN PERMEATE	33		33	34	33	35
SOLUTE REJECTION	0		0	-3	0	-6

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.- 34
DATE- 10/2/86

PRODUCT RUN NAPHTHALENE
CONC.(MOLAR) 33

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 25.5 C
33 INITIAL FEED CONC. (F1)- 33
FINAL FEED CONC. (F2)- 33

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
TEMP. CORR. FACTOR-

PURE SOLVENT RUN

1.0000 2.0000 3.0000 4.0000 5.0000 6.0000

CAB2 CAB1 CTA2 CTA1 PAM3 PAM1

CELL #

MEMBRANE TYPE

SAMPLE TIME (min.)

BOTTLE WEIGHT (grams)

BOTTLE+SAMPLE WEIGHT (grams)

SAMPLE WEIGHT (grams)

PERMEATE RATE (gr./hr.)

SOLUTE CONC. IN PERMEATE

SOLUTE REJECTION

1.7500 22.0445 33.2485 11.2250 384.8571 33 0

3.0000 22.3467 32.2467 9.9700 190.4000 34 -3

4.0000 22.5435 33.5370 10.9935 144.9025 34 -3

5.0000 22.1406 33.7986 11.6580 699.4800 33 0

6.0000 22.9093 28.2467 5.3374 64.0480 36 -15

EMR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.) - 25.5 C

PHASE- HEPTANE
RUN NO.- 35
DATE- 10/2/86

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE- 1000 P.
SYSTEM TEMP. (avg.) - 25.5 C
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR) -

PHASE- HEPTANE
RUN NO.- 36
DATE- 10/2/86

PRODUCT RUN BIPHENYL
CONC. (MMOLAR) 34

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	1.5000		3.0000	4.0000	1.0000	5.0000
BOTTLE WEIGHT (grams)	22.1070		21.7936	22.6891	22.2749	22.1151
BOTTLE+SAMPLE WEIGHT (grams)	32.5393		32.0416	34.0616	33.3673	27.1024
SAMPLE WEIGHT (grams)	10.4323		10.2480	11.3725	11.0924	4.9873
PERMEATE RATE (gr./hr.)	417.2920		204.9600	170.5875	665.5440	59.8476

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	1.0000		2.0000	3.0000	1.0000	4.0000
BOTTLE WEIGHT (grams)	23.0001		22.1557	23.0020	22.4890	22.3434
BOTTLE+SAMPLE WEIGHT (grams)	29.9165		28.9801	31.5396	33.7884	28.3268
SAMPLE WEIGHT (grams)	6.9164		6.8244	8.5368	11.2986	3.9834
PERMEATE RATE (gr./hr.)	414.9840		204.7320	170.7360	677.9160	59.7510
SOLUTE CONC. IN PERMEATE	33		34	34	33	40
% SOLUTE REJECTION	3		0	0	3	-18

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 37
DATE- 10/2/86

PHASE-
RUN NO.-
DATE-

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25.5 C
32 INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)- 32

PRODUCT RUN BIPHENYL
CONC.(MMOLAR)

PURE SOLVENT RUN
DATE-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	2.0000	3.0000	4.0000	1.0000	5.0000	
BOTTLE WEIGHT (grams)	22.0255	22.5023	22.3359	22.0302	22.0740	
BOTTLE+SAMPLE WEIGHT (grams)	27.9946	27.2423	27.5596	27.5792	24.8038	
SAMPLE WEIGHT (grams)	5.9741	4.7400	5.2237	5.5490	2.7298	
PERMEATE RATE (gr./hr.)	179.2250	94.8000	78.3555	332.9400	32.7576	
SOLUTE CONC. IN PERMEATE	34	35	33	32	37	
SOLUTE REJECTION	-6	-9	-3	0	-16	

EMR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 39
DATE- 11/2/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 39
DATE- 11/2/86

PRODUCT RUN METHYL NAPHTHALENE
CONE. (MMOLAR) 34

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C
INITIAL FEED CONC. (MMOLAR) 34
FINAL FEED CONC. (MMOLAR)- 34

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	4.0000	5.0000	6.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	21.8445	21.9638	22.1003	22.4784	21.8164	
BOTTLE+SAMPLE WEIGHT (grams)	30.7073	28.2311	28.6499	28.1001	25.3178	
SAMPLE WEIGHT (grams)	8.8628	6.2673	6.5496	5.6217	3.5014	
PERMEATE RATE (gr./hr.)	177.2560	94.0095	78.5952	337.3020	35.0140	

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	4.0000	5.0000	6.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	22.9814	22.4222	21.8931	21.8715	22.9251	
BOTTLE+SAMPLE WEIGHT (grams)	30.9444	28.6221	28.3720	27.3812	26.2775	
SAMPLE WEIGHT (grams)	8.8630	6.1999	6.4789	5.5097	3.3524	
PERMEATE RATE (gr./hr.)	177.6600	92.9985	77.7468	330.5820	33.5240	
SOLUTE CONC. IN PERMEATE	34	35	36	34	38	
SOLUTE REJECTION	0	-3	-6	0	-12	

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

HEPTANE
40
11/2/86

PRODUCT RUN
CONC (MOLAR)

1000 PSI
25 C

WORKING PRESSURE-
SYSTEM TEMP. (AVG.)-
TEMP. CORR. FACTOR-

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

HEPTANE
40
11/2/86

PRODUCT RUN
CONC (MOLAR)

1000 PSI
25 C

WORKING PRESSURE-
SYSTEM TEMP. (AVG.)-
TEMP. CORR. FACTOR-

PURE SOLVENT RUN
DATE-

1000 PSI
25 C

PHASE-
RUN NO.-
DATE-

HEPTANE
40
11/2/86

PRODUCT RUN
CONC (MOLAR)

1000 PSI
25 C

WORKING PRESSURE-
SYSTEM TEMP. (AVG.)-
TEMP. CORR. FACTOR-

PURE SOLVENT RUN
DATE-

1000 PSI
25 C

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMORANDUM TYPE	CAB2	CAB1	CTA2	CTA1	PAMS	PAM1	MEMORANDUM TYPE	CAB2	CAB1	CTA2	CTA1	PAMS	PAM1
SAMPLE TIME (min.)	1.5000		2.0000	3.0000	1.0000	4.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.5250		22.0956	22.5843	22.0672	21.9218	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	32.2312		28.8105	31.0627	32.8444	25.9284	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	9.7062		6.7149	8.4604	10.7792	4.0066	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	388.2480		201.4470	149.3680	644.7520	40.0990	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	34		34	34	34	39	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0		0	0	0	0	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 42
DATE- 12/2/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 43
DATE- 12/2/86

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25.5 C
INITIAL FEED CONC. (MMOLAR) 33
FINAL FEED CONC. (MMOLAR)- 33

PRODUCT RUN hexane
CONC. (MMOLAR) 33

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.5000		2.0000	3.0000	1.0000	4.0000
BOTTLE WEIGHT (grams)	21.9128		22.2054	22.4662	22.7974	21.7529
BOTTLE+SAMPLE WEIGHT (grams)	32.1502		29.0479	30.8215	33.9296	26.0446
SAMPLE WEIGHT (grams)	10.2374		6.8425	8.3553	11.1322	4.2917
PERMEATE RATE (gr./hr.)	409.4960		205.2750	167.1060	667.9320	64.3755
SOLUTE CONC. IN PERMEATE	32		32	32	33	33
SOLUTE REJECTION	3		3	3	0	0

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 44
 DATE- 12/7/86
 WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 24.5 C
 PRODUCT RUN hexane
 CONC.(MOL/LM)
 33 INITIAL FEED CONC. (F1)- 33
 FINAL FEED CONC. (F2)- 32
 PURE SOLVENT RUN
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-
 TEMP. CORR. FACTOR-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PMA3	PMA1	MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PMA3	PMA1
SAMPLE TIME (min.)	3.0000		4.0000	5.0000	1.0000	6.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.5439		23.5181	21.9199	21.7922	22.5898	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	31.8048		30.0674	28.7890	27.5046	26.1653	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	9.2609		6.5493	6.8691	5.7144	3.5755	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	185.2180		98.2395	82.4292	342.8640	35.7550	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	32		32	32	32	33	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	3		3	3	3	0	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 45
DATE- 12/2/86

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 46
DATE- 12/2/86

PRODUCT RUN DIMETHYLBUTANE
CONC. (MMOLAR) 39

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25.5 C
INITIAL FEED CONC. (MMOLAR) 39
FINAL FEED CONC. (MMOLAR) 39

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.5000		3.0000	4.0000	1.0000	5.0000
BOTTLE WEIGHT (grams)	22.4920		22.4648	22.3400	22.4691	22.3473
BOTTLE+SAMPLE WEIGHT (grams)	53.1742		27.2523	27.6242	28.9575	25.3408
SAMPLE WEIGHT (grams)	10.4822		4.7875	5.2842	5.5884	3.0135
PERMEATE RATE (gr./hr.)	183.1234		93.7500	78.9430	335.3040	36.1620

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000		3.0000	4.0000	1.0000	5.0000
BOTTLE WEIGHT (grams)	22.0770		21.8487	23.1540	21.9322	22.9296
BOTTLE+SAMPLE WEIGHT (grams)	28.5361		26.8112	28.6262	27.7993	28.0181
SAMPLE WEIGHT (grams)	6.4591		4.9425	5.4702	5.8671	3.0885
PERMEATE RATE (gr./hr.)	193.7750		98.8500	82.0530	332.0260	37.0420
SOLUTE CONC. IN PERMEATE	38		37	37	38	34
SOLUTE REJECTION	3		5	5	3	13

EW - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 47
DATE- 12/7/86

PRODUCT RUN D1METHYLUNAN
CONC.(MOLAR) 37
WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (F1)- 36
FINAL FEED CONC. (F2)- 37

EW - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
TEMP. CORR. FACTOR-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
BOTTLE WEIGHT (grams)	22.6948	22.0156	22.1852	22.4608	22.8846	
BOTTLE+SAMPLE WEIGHT (grams)	29.5054	28.8277	30.8343	33.1779	26.8989	
SAMPLE WEIGHT (grams)	6.8106	6.8121	8.6491	10.7171	4.0143	
ENHDATE RATE (gr./hr.)	408.6340	204.3630	172.9820	643.0260	60.2145	
SOLUTE CONC. IN ENHDATE	38	38	36	37	32	
SOLUTE SECTION	-3	-3	3	0	14	

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 48
DATE- 13/2/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 49
DATE- 13/2/86

WORKING PRESSURE- 1000
SYSTEM TEMP. (avg.)- 25.
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR) -

PRODUCT RUN
CONC. (MMOLAR) 22

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
BOTTLE WEIGHT (grams)	22.4698	22.3279	22.4972	22.1417	22.2521	22.2521
BOTTLE+SAMPLE WEIGHT (grams)	29.2966	29.2815	31.2272	33.2066	26.4036	26.4036
SAMPLE WEIGHT (grams)	6.8268	6.8736	8.7300	11.0649	4.1515	4.1515
PERMEATE RATE (gr./hr.)	409.6080	206.2080	174.6000	663.8940	62.2725	62.2725
SOLUTE CONC. IN PERMEATE	19	33	23	23	23	24
SOLUTE REJECTION	14	-50	-5	-5	-5	-9

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
BOTTLE WEIGHT (grams)	22.9385	22.8458	22.1205	22.8907	22.1665	22.1665
BOTTLE+SAMPLE WEIGHT (grams)	30.1905	29.8869	31.0963	34.1015	26.4217	26.4217
SAMPLE WEIGHT (grams)	7.2520	7.0411	8.9758	11.2108	4.2552	4.2552
PERMEATE RATE (gr./hr.)	435.1200	211.2330	179.5160	672.6486	63.8280	63.8280
SOLUTE CONC. IN PERMEATE	19	33	23	23	23	24
SOLUTE REJECTION	14	-50	-5	-5	-5	-9

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
 RUN NO.-
 DATE-
 13/2/86
 50
 13/2/86
 HEPTANE
 PRODUCT RUN
 CONC.(MOLAL)
 1-OCTANE
 23
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-
 INITIAL FEED CONC. (F1)-
 FINAL FEED CONC. (F2)-
 500 PSI
 24.75 C
 20
 25

PURE SOLVENT RUN
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

PHASE-
 RUN NO.-
 DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMA3	PMA1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMA3	PMA1
SAMPLE TIME (min.)	2.0000		3.0000	8.0000	1.0000	5.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.4690		22.2758	22.3972	22.1283	22.1247	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	28.6363		27.1372	27.8155	27.7556	24.9656	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	6.1673		4.8614	5.4183	5.6273	2.8409	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	185.0190		97.2280	81.2745	337.6380	34.0908	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	31		21	25	23	20	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-35		9	-9	0	13	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- S2
 DATE- 13/7/86

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-
 INITIAL FEED CONC. (MMOL/L)-
 FINAL FEED CONC. (MMOL/L)-

PRODUCT RUN METABECANE
 CONC. (MMOL/L) 28

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- S1
 DATE- 13/2/86

WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000		4.0000	5.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	21.8957		22.4879	21.8459	22.3143	21.7618
BOTTLE+SAMPLE WEIGHT (grams)	30.9693		28.9042	28.3126	27.7854	25.2112
SAMPLE WEIGHT (grams)	9.0736		6.2163	6.4667	5.4711	3.4494
PERMEATE RATE (gr./hr.)	181.4720		93.2445	77.6004	328.2640	34.4940
SOLUTE CONC. IN PERMEATE	29		27	27	27	21
SOLUTE REJECTION	-4		4	4	4	25

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

1000 PSI
25.5 C

28
27

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PRODUCT RUN HEPTANE
CONC.(MOLAR)

28 INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	MEMBRANE TYPE	SAMPLE TIME (min.)	BOTTLE WEIGHT (grams)	BOTTLE+SAMPLE WEIGHT (grams)	SAMPLE WEIGHT (grams)	PERMEATE RATE (gr./hr.)
CA02	CA01	CA02	CA01	CA03	CA01	PAN1		1.0000	22.0136	21.8324	22.7748	22.5158
1.0000		2.0000	3.0000	1.0000	4.0000	PAN1						
21.8787		22.0136	21.8324	22.7748	22.5158							
28.4613		28.7827	30.3485	33.5413	26.4906							
6.5826		6.7691	8.5161	10.7665	3.9748							
194.9560		203.0730	170.3220	645.9900	59.6220							
28		27	28	27	18							
0		6	0	4	36							

EHR - HEPTANE, TOLUENE PROJECT
 PHASE - HEPTANE
 RUN NO. - 54
 DATE - 14/2/86
 WORKING PRESSURE - 1000 PSI
 SYSTEM TEMP. (avg.) - 25.5 C
 PRODUCT RUN 1-MOMENE
 CONC. (MMOLAR) 35
 WORKING PRESSURE - 500
 SYSTEM TEMP. (avg.) - 24.1
 INITIAL FEED CONC. (MMOLAR)
 FINAL FEED CONC. (MMOLAR) -

EHR - HEPTANE, TOLUENE PROJECT
 PHASE - HEPTANE
 RUN NO. - 54
 DATE - 14/2/86
 PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	2.0000		3.5000	4.0000	1.0000	5.0000
BOTTLE WEIGHT (grams)	22.5907		22.3369	22.6736	22.3867	22.0473
BOTTLE+SAMPLE WEIGHT (grams)	28.3804		27.9725	28.0752	27.7503	24.7259
SAMPLE WEIGHT (grams)	5.9997		5.6356	5.4016	5.3636	2.6786
PERMEATE RATE (gr./hr.)	179.9910		96.6103	81.0240	321.8160	32.1432
SOLUTE CONC. IN PERMEATE	36		35	34	34	34
SOLUTE REJECTION	-3		0	3	3	3

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 24 C

PHASE - HEPTANE
RUN NO. - 57
DATE - 14/2/86

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 24.3 C
INITIAL FEED CONC. (MOLAR) - 35
FINAL FEED CONC. (MOLAR) - 34

PHASE - HEPTANE
RUN NO. - 58
DATE - 14/2/86

PRODUCT RUN 1-HEPTENE
CONC. (MOLAR) - 35

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000	3.0000	4.0000	1.0000	5.0000	
BOTTLE WEIGHT (grams)	22.4645	22.0665	22.8152	22.0833	22.0016	
BOTTLE+SAMPLE WEIGHT (grams)	28.5979	26.8279	28.3126	27.5494	24.7631	
SAMPLE WEIGHT (grams)	6.1334	4.7614	5.4974	5.4661	2.7615	
PENMEATE RATE (gr./hr.)	184.0020	95.2280	82.4610	327.9660	33.1380	
SOLUTE CONC. IN PENMEATE	34	34	34	34	34	34
SOLUTE REJECTION	3	3	3	3	3	3

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PHASE-
RUN NO.-
DATE-

1000 PSI
25.3 C
34
35

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

PRODUCT RUN
CONC. (MOL/L)

HEPTANE
59
14/2/86

PURE SOLVENT RUN
SYSTEM TEMP. (avg.)-

PHASE-
RUN NO.-
DATE-

1000 PSI
25.3 C
34
35

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

PRODUCT RUN
CONC. (MOL/L)

HEPTANE
59
14/2/86

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
HEXAMER TYPE	CAR2	CAB1	CTA2	CTA1	PAM3	PAM1	HEXAMER TYPE	CAR2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.0000		2.0000	3.0000	1.0000	4.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	21.9259		22.0796	21.8110	22.1347	22.8133	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	28.6392		29.0913	30.5930	32.7056	26.7392	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	6.7133		7.0117	8.7820	10.5709	3.9259	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	402.7980		210.3510	175.6400	634.7540	58.8885	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	34		34	35	35	37	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	3		3	0	0	-6	SOLUTE REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE- 1900 PSI
SYSTEM TEMP. (avg.)- 25 C

PHASE- HEPTANE
RUN NO.- 40
DATE- 17/2/86

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25.5 C
INITIAL FEED CONC. (MMOL/L)-
FINAL FEED CONC. (MMOL/L)-

PHASE- HEPTANE
RUN NO.- 51
DATE- 17/2/86

PRODUCT RUN n-DECALINE
CONC. (MMOL/L)- 36

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.0000	3.0000	3.0000	3.0000	1.0000	6.0000
BOTTLE WEIGHT (grams)	21.9178	22.3234	22.2846	22.5963	22.9019	22.0955
BOTTLE+SAMPLE WEIGHT (grams)	28.0226	32.2595	30.6146	29.6655	27.7951	24.9018
SAMPLE WEIGHT (grams)	6.1048	9.9361	8.3300	7.9075	4.8932	2.8063
PERMEATE RATE (gr./hr.)	346.2880	198.7220	166.6000	158.1500	293.5920	28.0430
SOLUTE CONC. IN PERMEATE				32	32	37
SOLUTE REJECTION				11	11	-3

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE -
RUN NO. - 62
DATE - 17/2/86

PRODUCT RUN n-DECYLAMINE
CONC (MOLAR) 33

WORKING PRESSURE -
SYSTEM TEMP. (avg.) - 25.5 C
INITIAL FEED CONC. (F1) - 32
FINAL FEED CONC. (F2) - 33

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
RENAME TYPE	CAR2	CAB1	CTA2	CTA1	PMS3	PMB1	RENAME TYPE	CAR2	CAB1	CTA2	CTA1	PMS3	PMB1
SAMPLE TIME (min.)	3.0000		4.0000	5.0000	2.0000	10.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.3067		22.6744	22.4436	23.5162	23.0144	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	27.4624		28.1964	28.5557	28.5770	25.6171	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	5.1757		5.5220	6.1121	5.0608	2.6027	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	103.5140		82.8300	73.3452	151.8240	15.6162	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	40		36	33	39	36	SOLUTE CONC. IN PERMEATE						
% SOLUTE REJECTION	-21		-9	0	-10	-9	% SOLUTE REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 24. C
INITIAL FEED CONC. (MMOLAR) - 15
FINAL FEED CONC. (MMOLAR) - 22

PRODUCT RUN DIBENZYLAMINE
CONC. (MMOLAR) 19

PHASE - HEPTANE
RUN NO. - 64
DATE - 17/2/86

EMR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.) - 24 C

PHASE - HEPTANE
RUN NO. - 63
DATE - 17/2/86

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000		3.0000	4.0000	2.0000	9.0000
BOTTLE WEIGHT (grams)	22.7410		22.1365	21.4496	21.9407	22.5817
BOTTLE+SAMPLE WEIGHT (grams)	27.9618		26.2547	26.2064	26.2064	25.3312
SAMPLE WEIGHT (grams)	5.2208		4.1182	4.7568	4.2657	2.7495
PERMEATE RATE (gr./hr.)	156.6240		82.3640	71.3520	127.9710	18.3300
SOLUTE CONC. IN PERMEATE	70		13	23	16	25
SOLUTE REJECTION	-5		37	-21	16	-32

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 65
DATE- 17/2/86

PRODUCT RUN DIBENZYLAMINE
CONC (MOLAR) 15 INITIAL FEED CONC. (F1) -
FINAL FEED CONC. (F2) -

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25.5 C
12
10

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

PHASE-
RUN NO.-
DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.0000		2.0000	3.0000	1.5000	5.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.3433		22.2445	22.1656	22.4113	22.3487	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	27.5284		28.0941	29.8574	30.4826	25.2676	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	5.1851		5.8446	7.6918	8.2713	2.9189	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	311.1040		175.3380	153.8560	350.8520	35.0260	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	17		21	19	11	"9	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-13		-40	-27	27	-93	SOLUTE REJECTION						

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 66
DATE- 10/2/86

WORKING PRESSURE
SYSTEM TEMP. (avg.)-
1000 PSI
24.5 C

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 67
DATE- 10/2/86

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-
1000 PS
24.5 C
8
8

PRODUCT RUN DECANETHIOL
CONC. (MMOLAR)
02

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.0000		2.0000	3.0000	1.0000	4.0000
BOTTLE WEIGHT (grams)	22.4927		22.1191	22.1567	21.7702	22.3970
BOTTLE+SAMPLE WEIGHT (grams)	26.1562		28.1803	30.0370	27.9363	24.7540
SAMPLE WEIGHT (grams)	3.6635		6.0412	7.8803	6.1661	2.3570
PERMEATE RATE (gr./hr.)	219.8100		181.2360	157.6060	369.9460	35.3550
SOLUTE CONC. IN PERMEATE	79		75	74	70	86
SOLUTE REJECTION	4		9	10	15	-5

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

HEPTANE
10/2/86
10/2/86

PHASE-
RUN NO.-
DATE-

HEPTANE
10/2/86
10/2/86

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

HEPTANE
10/2/86
10/2/86

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAR2	CAB1	C1A2	C1A1	PAM3	PAM1	MEMBRANE TYPE	CAR2	CAB1	C1A2	C1A1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	4.0000	4.0000	5.0000	3.0000	9.0000	SAMPLE TIME (min.)	3.0000	4.0000	4.0000	5.0000	3.0000	9.0000
BOTTLE WEIGHT (grams)	22.2621	22.1745	22.2022	22.4244	21.9894	21.9894	BOTTLE WEIGHT (grams)	22.2621	22.1745	22.2022	22.4244	21.9894	21.9894
BOTTLE+SAMPLE WEIGHT (grams)	29.2308	27.9818	28.5743	32.5619	25.0278	25.0278	BOTTLE+SAMPLE WEIGHT (grams)	29.2308	27.9818	28.5743	32.5619	25.0278	25.0278
SAMPLE WEIGHT (grams)	5.9687	5.8073	6.2921	10.1575	3.0384	3.0384	SAMPLE WEIGHT (grams)	5.9687	5.8073	6.2921	10.1575	3.0384	3.0384
PERMEATE RATE (gr./hr.)	119.3740	87.1095	75.5052	202.7500	20.2560	20.2560	PERMEATE RATE (gr./hr.)	119.3740	87.1095	75.5052	202.7500	20.2560	20.2560
SOLUTE CONC. IN PERMEATE	87	92	91	85	71	71	SOLUTE CONC. IN PERMEATE	87	92	91	85	71	71
SOLUTE REJECTION	1	-5	-3	3	19	19	SOLUTE REJECTION	1	-5	-3	3	19	19

EMR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 69
DATE- 19/2/86

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 23 C

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 70
DATE- 19/2/86

WORKING PRESSURE- 50-
SYSTEM TEMP. (avg.)- 25.
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

PRODUCT RUN O-CRESOL
CONC. (MMOLAR) 31

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	13.0000		6.0000	6.0000	5.0000	13.0000
BOTTLE WEIGHT (gr.ass)	22.2995		22.8870	22.3289	22.8356	22.1042
BOTTLE+SAMPLE WEIGHT (gr.ass)	25.4119		28.0526	27.1158	28.0727	25.0964
SAMPLE WEIGHT (gr.ass)	3.1124		5.1656	4.7869	5.2371	2.9922
PERMEATE RATE (gr./hr.)	14.3649		51.6560	47.8690	62.8452	13.8102
SOLUTE CONC. IN PERMEATE	36	36	38	36	37	38
II SOLUTE REJECTION	-16		-23	-16	-19	-23

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 71
 DATE- 19/2/86

PRODUCT RUN 0-CRESOL
 CONC (MOLAR)

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)- 1000 PSI
 25 C

32 INITIAL FEED CONC. (F1)- 32
 FINAL FEED CONC. (F2)- 32

PURE SOLVENT RUN
 DATE-

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	3.0000	4.0000	4.0000	4.0000	7.0000	7.0000						
BOTTLE WEIGHT (grams)	22.4738	21.8480	22.0126	21.7148	22.4046							
BOTTLE+SAMPLE WEIGHT (grams)	26.3936	28.6136	28.7174	25.4731	25.4592							
SAMPLE WEIGHT (grams)	3.9198	6.7656	6.7048	3.7583	2.9746							
PERMEATE RATE (gr./hr.)	78.3960	101.4860	100.5720	32.2140	25.4966							
SOLUTE CONC. IN PERMEATE	31	34	37	39	47							
SOLUTE REJECTION	3	-6	-16	-22	-47							

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 73
 DATE- 20/2/06

WORKING PRESSURE 1000 PSI
 SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 74
 DATE- 20/2/06

PRODUCT RUN PHENOL
 CONC. (MMOLAR) 33

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25.5 C
 INITIAL FEED CONC. (MMOLAR)
 FINAL FEED CONC. (MMOLAR)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PM11
SAMPLE TIME (min.)	2.0000	3.0000	4.0000	5.0000	6.0000	
BOTTLE WEIGHT (grams)	21.7632	22.4093	23.5240	22.4077	22.0192	
BOTTLE+SAMPLE WEIGHT (grams)	32.1449	29.0420	31.9494	29.0269	25.9008	
SAMPLE WEIGHT (grams)	10.3837	6.6327	8.4254	6.5392	3.8816	
PERMEATE RATE (gr./hr.)	311.5110	132.4540	126.3810	392.3520	46.5792	

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PM11
SAMPLE TIME (min.)	no flux	no flux	no flux	10.0000	2.0000	9.0000
BOTTLE WEIGHT (grams)	22.3796	22.5558	22.4206	22.2354	22.7978	
BOTTLE+SAMPLE WEIGHT (grams)	no flux	no flux	no flux	23.2196	29.3236	25.4041
SAMPLE WEIGHT (grams)	-22.3796	-22.5558	0.7990	7.0882	2.6043	
PERMEATE RATE (gr./hr.)			4.7940	212.6460	17.3753	
SOLUTE CONC. IN PERMEATE	no sample	no sample	39	36	46	
% SOLUTE REJECTION			-18	-9	-39	

EHR - HEPTANE, TOLUENE PROJECT

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 75
 DATE- 20/2/86
 PRODUCT RUN PHENOL
 CONC (MMOL/L) 33
 INITIAL FEED CONC. (F1)- 33
 FINAL FEED CONC. (F2)- 33
 WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 25.25 C
 PURE SOLVENT RUN
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	no flux		no flux	15.0000	4.0000	15.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.2645		22.5027	22.5862	22.8483	22.8096	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	no flux		no flux	23.1596	28.9717	24.8638	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	-22.2645		-22.5027	0.5734	6.1234	2.0542	SAMPLE WEIGHT (grams)						
PENEGATE RATE (gr./hr.)				2.2936	91.8510	8.2168	PENEGATE RATE (gr./hr.)						
SOLUTE CONC. IN PENEGATE	no sample		no sample	52	39	41	SOLUTE CONC. IN PENEGATE						
1 SOLUTE REJECTION				-58	-18	-24	1 SOLUTE REJECTION						

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 76
DATE- 24/2/86

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 24.75 C

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000
BOTTLE WEIGHT (grams)	22.4564	22.4305	22.5062	22.7112	22.7308	
BOTTLE+SAMPLE WEIGHT (grams)	27.6731	26.7530	26.8009	31.5681	27.2960	
SAMPLE WEIGHT (grams)	5.2167	4.3225	4.2947	8.8569	4.5652	
PERMEATE RATE (gr./hr.)	104.3340	86.4500	85.8940	531.4140	91.3040	

EHR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 77
DATE- 24/2/86

WORKING PRESSURE- 500
SYSTEM TEMP. (avg.)- 25.
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

PRODUCT RUN VOLUMES (mls)
CONC. (MMOLAR) 36

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	3.0000	3.0000	3.0000	1.0000	3.0000
BOTTLE WEIGHT (grams)	22.8035	22.2434	22.5191	22.6651	22.6667	
BOTTLE+SAMPLE WEIGHT (grams)	29.0270	26.6732	26.9383	31.9892	27.8312	
SAMPLE WEIGHT (grams)	6.2235	4.4298	4.4192	9.3241	5.1445	
PERMEATE RATE (gr./hr.)	124.4700	88.5960	88.3840	559.4460	102.8900	
SOLUTE CONC. IN PERMEATE	34	36	34	37	35	
SOLUTE REJECTION	6	0	6	-3	3	

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

HEPTANE
78
24/2/86

PRODUCT RUN
CONC.(MOL/L)

1000 PSI
24.5 C

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

ENR - HEPTANE, TOLUENE PROJECT

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMS3	PMS1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMS3	PMS1
SAMPLE TIME (min.)	2.0000		2.0000	2.0000	0.5000	2.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	21.7896		22.0815	22.0138	22.8126	22.9782	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	30.0551		28.2692	28.2379	31.7447	28.5757	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	8.2655		6.1877	6.2241	8.9321	5.5975	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	247.9850		185.6310	186.7230	1071.8520	167.9250	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	34		35	35	34	36	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	3		0	0	3	-3	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 80
 DATE- 24/2/86

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25 C

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 24.5 C
 INITIAL FEED CONC. (MMOLAR) -
 FINAL FEED CONC. (MMOLAR) -

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO.- 79
 DATE- 24/2/86

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	2.0000		2.0000	2.0000	2.0000	3.0000
BOTTLE WEIGHT (grams)	22.5651		22.5405	22.5914	22.3323	22.4467
BOTTLE+SAMPLE WEIGHT (grams)	30.8571		28.4482	28.0598	26.3080	27.8312
SAMPLE WEIGHT (grams)	8.2920		6.1277	5.4684	3.9757	5.1445
PERMEATE RATE (gr./hr.)	248.7400		183.8310	164.0520	119.2710	102.8900
SOLUTE CONC. IN PERMEATE	30		31	32	31	28
% SOLUTE REJECTION	3		0	-3	0	10

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PHASE-
RUN NO.-
DATE-

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

500 PSI
25.5 C
30
30

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	1.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1	CAB2	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	3.0000		3.0000	3.0000	1.0000	3.0000					
BOTTLE WEIGHT (grams)	22.8207		23.5252	22.5621	22.7513	22.4209					
BOTTLE+SAMPLE WEIGHT (grams)	28.6660		27.0830	26.9506	31.2949	25.7676					
SAMPLE WEIGHT (grams)	5.8453		4.3578	4.3885	8.5436	3.3467					
PERMEATE RATE (gr./hr.)	116.9040		87.1540	87.7700	512.6160	66.7340					
SOLUTE CONC. IN PERMEATE	31		30	30	31	29					
SOLUTE REJECTION	-3		0	0	-3	3					

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

HEPTANE
84
25/2/86

PRODUCT RUN
CONC (WOLAR)

1000 PSI
25 C

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

32
29

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PMH1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PMH1
SAMPLE TIME (min.)	2.0000		2.0000	2.0000	0.5000	2.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.2251		22.2421	21.7715	22.4585	22.5447	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	29.8138		28.3763	27.9389	30.3776	26.8258	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	7.5887		6.1342	6.1674	7.9191	4.2811	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	227.6410		184.0260	185.0220	950.7920	128.4330	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	32		33	31	32	33	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-3		-6	0	-3	-6	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE - HEPTANE
RUN NO. - 83
DATE - 25/2/86

WORKING PRESSURE - 1000 PSI
SYSTEM TEMP. (avg.) - 25.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE - HEPTANE
RUN NO. - 86
DATE - 25/2/86

WORKING PRESSURE - 1000 PSI
SYSTEM TEMP. (avg.) - 24 C
INITIAL FEED CONC. (MMOL/L) - 35
FINAL FEED CONC. (MMOL/L) - 35

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000		2.0000	2.0000	0.5000	2.0000
BOTTLE WEIGHT (grams)	21.6591		22.7439	22.8438	21.9925	22.7969
BOTTLE+SAMPLE WEIGHT (grams)	30.6665		29.1079	29.2017	30.2896	27.0265
SAMPLE WEIGHT (grams)	9.0074		6.3640	6.3579	8.2971	4.2296
PERMEATE RATE (gr./hr.)	270.2220		190.9200	190.7370	995.6520	126.8880
SOLUTE CONC. IN PERMEATE	35		35	35	35	32
% SOLUTE REJECTION	0		0	0	0	9

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.- 87
DATE- 25/2/86

PRODUCT RUN METHYL CYCLOHEXANE
CONC. (MOLAR) 35
INITIAL FEED CONC. (F1)- 35
FINAL FEED CONC. (F2)- 35

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

PHASE-
RUN NO.-
DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	3.0000		3.0000	3.0000	1.0000	3.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.1691		22.7333	22.5281	22.6871	22.2873	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	28.0963		27.0982	26.8391	30.6201	25.5350	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	5.9272		4.3649	4.3110	7.9330	3.2477	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	118.5440		87.2960	86.2200	475.9800	64.9540	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	35		35	35	35	34	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0		0	0	0	3	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 24.25 C

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 25.25 C
INITIAL FEED CONC. (MMOL/L) - 32
FINAL FEED CONC. (MMOL/L) - 35

PHASE - HEPTANE
RUN NO. - 88
DATE - 26/2/86

PHASE - HEPTANE
RUN NO. - 89
DATE - 26/2/86

PRODUCT RUN CYCLOHEXANE
CONC. (MMOL/L) - 34

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CA82	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.00	3.00	3.00	3.00	1.00	3.00
BOTTLE WEIGHT (grams)	22.92		22.50	21.87	22.33	22.60
BOTTLE+SAMPLE WEIGHT (grams)	29.16		26.87	26.11	30.46	25.98
SAMPLE WEIGHT (grams)	6.24		4.36	4.24	8.13	3.38
PERMEATE RATE (gr./hr.)	124.79		87.29	84.89	487.76	67.56
SOLUTE CONC. IN PERMEATE	32		34	32	32	35
SOLUTE REJECTION	6		0	6	6	-3

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

HEPTANE
90
26/2/86

PRODUCT RUN
CONC (MOL/L)

1000 PSI
25.5 C

37
33

PHASE-
RUN NO.-
DATE-

HEPTANE
90
26/2/86

PURE SOLVENT RUN

1000 PSI
25.5 C

37
33

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

HEPTANE
90
26/2/86

CELL #	1.00	2.00	3.00	4.00	5.00	6.00	CELL #	1.00	2.00	3.00	4.00	5.00	6.00
HEPTANE TYPE	CAB2	CAB1	CTA2	CTA1	PMA3	PMA1	HEPTANE TYPE	CAB2	CAB1	CTA2	CTA1	PMA3	PMA1
SAMPLE TIME (min.)	2.00		2.00	2.00	0.50	2.00	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.30		22.09	22.37	22.77	22.00	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	30.75		28.39	28.63	30.76	26.01	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	8.44		6.30	6.26	7.99	4.00	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	253.25		186.93	187.93	958.52	120.09	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	34		35	35	33	36	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	3		0	0	6	-3	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 91
DATE- 26/2/86

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25.25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 92
DATE- 26/2/86

PRODUCT RUN
CONC. (MMOLAR) 34

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25.3 C
INITIAL FEED CONC. (MMOLAR) 32
FINAL FEED CONC. (MMOLAR)- 34

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	3.0000		3.0000	3.0000	0.5000	3.0000
BOTTLE WEIGHT (grams)	22.3870		22.2639	22.8459	21.8920	21.9445
BOTTLE+SAMPLE WEIGHT (grams)	33.0090		26.2516	26.9526	26.5029	25.3870
SAMPLE WEIGHT (grams)	10.6220		3.9877	4.1067	4.6109	3.4425
PERMEATE RATE (gr./hr.)	212.4400		79.7540	82.1340	553.3080	68.8500
SOLUTE CONC. IN PERMEATE	36		42	42	36	44
SOLUTE REJECTION	-6		-24	-24	-6	-29

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.- 93
DATE- 26/2/86

WORKING PRESSURE-
500 PSI
24.5 C
p-CRESOL SYSTEM TEMP. (avg.)-
34 INITIAL FEED CONC. (F1)-
34 FINAL FEED CONC. (F2)-

PRODUCT RUN
CONC (MOLAR)

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	5.0000		6.0000	6.0000	1.0000	5.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.3223		22.6344	22.8168	22.1564	22.5918	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	30.0994		26.1470	26.4910	27.3701	26.0911	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	7.7771		3.5126	3.6742	5.2137	3.4993	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	93.3252		35.1260	36.7420	312.8220	41.9916	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	33		44	44	35	39	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	3		-29	-29	-3	-15	SOLUTE REJECTION						

EMP - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 94
DATE- 27/2/86

WORKING PRESSURE
SYSTEM TEMP. (avg.) -
50.0 PSI
24.25 C

EMP - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 95
DATE- 27/2/86

PRODUCT RUN BENZOTHIOPHENE
CONC. (MMOLAR) 30

WORKING PRESSURE-
SYSTEM TEMP. (avg.) -
INITIAL FEED CONC. (MMOLAR)

PURE SOLVENT RUN

FINAL FEED CONC. (MMOLAR) -

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	2.0000		4.0000	4.0000	1.0000	4.0000
BOTTLE WEIGHT (grams)	22.6916		22.6301	22.0344	23.0430	22.6091
BOTTLE+SAMPLE WEIGHT (grams)	30.2930		26.4558	25.9392	27.7557	26.6251
SAMPLE WEIGHT (grams)	7.6014		3.8257	3.9048	4.7127	4.0160
PERMEATE RATE (gr./hr.)	228.0420		57.3855	58.5720	282.7620	60.2400
SOLUTE CONC. IN PERMEATE	31		32	32	32	33
SOLUTE REJECTION	-3		-7	-7	-7	-10

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
 RUN NO. - 96
 DATE- 27/2/86

PRODUCT RUN BENZOTHIOPHENE
 CONC (MOLAR) 30

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25.5 C
 INITIAL FEED CONC. (F1)- 30
 FINAL FEED CONC. (F2)- 30

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
 RUN NO.-
 DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PAM1
SAMPLE TIME (min.)	1.0000		3.0000	3.0000	1.0000	3.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.6482		22.3181	22.6593	22.4054	22.8857	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	30.2869		28.4764	28.9417	30.8271	28.4503	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	7.6387		6.1583	6.2824	8.4217	5.5646	SAMPLE WEIGHT (grams)						
ENRGATE RATE (gr./hr.)	458.3720		123.1660	125.6480	505.3020	111.2920	PERMEATE RATE (gr./hr.)						
SOLUTE INC. IN ENRGATE	31		31	30	30	36							
SOLUTE EJECTION	-3		-3	0	0	-20							

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.) -
1000 PSI
25 C

PHASE- HEPTANE
RUN NO.- 97
DATE- 27/2/86

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.0000	3.0000	3.0000	3.0000	1.0000	3.0000
BOTTLE WEIGHT (grams)	21.9450	22.3522	22.0480	22.4855	22.7888	
BOTTLE+SAMPLE WEIGHT (grams)	30.3424	28.8376	27.2101	30.8509	27.7822	
SAMPLE WEIGHT (grams)	8.3974	6.4854	5.1421	8.1654	4.9934	
PERMEATE RATE (gr./hr.)	503.8440	129.7080	102.8420	489.9240	99.8680	
SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.) -
1000 PSI
25 C
INITIAL FEED CONC. (MMOLAR) -
36
FINAL FEED CONC. (MMOLAR) -
38

PHASE- HEPTANE
RUN NO.- 98
DATE- 27/2/86

PRODUCT RUN DIBENZOTHIOPHEN
CONC. (MMOLAR) 37

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	1.0000	3.0000	3.0000	3.0000	1.0000	3.0000
BOTTLE WEIGHT (grams)	22.3878	21.9463	22.1590	22.4847	22.6342	
BOTTLE+SAMPLE WEIGHT (grams)	31.2188	26.4470	27.2562	30.3901	27.0924	
SAMPLE WEIGHT (grams)	8.8310	4.5007	5.0972	7.9054	4.4582	
PERMEATE RATE (gr./hr.)	529.8600	90.0140	101.9440	474.3240	89.1640	
SOLUTE CONC. IN PERMEATE	36	37	42	43	55	
SOLUTE REJECTION	3	0	-14	-16	-49	

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE- HEPTANE
RUN NO.- 99
DATE- 27/2/86

PRODUCT RUN DIBENZOTHIOPHENE
CONC.(MOLAR) 40
INITIAL FEED CONC.(F1)- 40
FINAL FEED CONC.(F2)- 39

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

PHASE-
RUN NO.-
DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000		5.0000	5.0000	1.0000	5.0000						
BOTTLE WEIGHT (gr ams)	22.0440		22.6502	22.1796	21.8798	22.9482						
BOTTLE+SAMPLE WEIGHT (gr ams)	29.7629		27.5065	25.9355	25.7000	26.4488						
SAMPLE WEIGHT (gr ams)	7.7189		4.8563	3.7559	3.8202	3.5006						
PERMEATE RATE (gr./hr.)	231.5670		58.2756	45.0708	229.2120	42.0072						
SOLUTE CONC. IN PERMEATE	41		44	38	37	43						
SOLUTE REJECTION	-3		-10	5	8	-8						

APPENDIX C
TOLUENE TEST DATA

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 500 PSI
25 C

PHASE- TOLUENE
RUN NO.- 1.0000
DATE- 13/12/85

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 500 PSI
25 C
PRODUCT RUN BENZENE
CONC. (MW/LAR) 120.0000 INITIAL FEED CONC. (F1)-
118.0000
FINAL FEED CONC. (F2)-
121.0000

PHASE- TOLUENE
RUN NO.- 2.0000
DATE- 13/12/85

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PMK1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PMK1
SAMPLE TIME (min.)	9.9200	15.3700	11.2700	20.3700	1.1330	0.2500	SAMPLE TIME (min.)	9.3360	11.0667	10.1667	16.2000	1.1000	0.3333
BOTTLE WEIGHT (grams)	22.6044	22.1841	22.2120	22.3263	21.8987	22.2528	BOTTLE WEIGHT (grams)	21.9799	22.2644	22.2541	22.3163	22.5046	22.0431
BOTTLE+SAMPLE WEIGHT (grams)	30.5725	28.5644	30.1956	27.8565	32.0706	36.3562	BOTTLE+SAMPLE WEIGHT (grams)	29.5538	26.6139	29.4553	26.6512	32.5895	36.7565
SAMPLE WEIGHT (grams)	7.9661	6.3803	7.9836	5.5302	10.1719	14.1034	SAMPLE WEIGHT (grams)	7.5739	4.3495	7.2012	4.3349	10.0849	14.7074
PERMEATE RATE (gr./hr.)	48.1821	24.9068	42.5036	16.2892	538.6708	3384.8160	PERMEATE RATE (gr./hr.)	48.7068	23.5816	42.4987	16.8552	550.0855	2647.5948
SOLUTE CONC. IN PERMEATE							SOLUTE CONC. IN PERMEATE	123.0000	121.0000	123.0000	123.0000	122.0000	122.0000
% SOLUTE REJECTION							% SOLUTE REJECTION	-2.5000	-0.8333	-2.5000	-2.5000	-1.6667	-1.6667

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

TOLUENE
3.0000
13/12/85

PRODUCT RUN BENZENE
CONC.(MOLAR) 118.0000
INITIAL FEED CONC.(F1)-
FINAL FEED CONC.(F2)-

1000 PSI
25 C
118.0000
117.0000

WORKING PRESS
SYSTEM TEMP. (avg.)

PHASE-
RUN NO.-
DATE-

TOLUENE
4.0000
13/12/85

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
TEMP. CORR. FACTOR-

1000 PSI
25.0000
1.0000

ENR - HEPTANE, TOLUENE PROJECT

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CM2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CM2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	7.9500	10.2667	8.4333	12.2667	0.6667	0.1333	SAMPLE TIME (min.)	9.0500	16.0000	9.0500	16.2500	0.6667	0.1667
BOTTLE WEIGHT (grams)	21.9649	22.4493	22.3699	22.1459	22.0546	22.2577	BOTTLE WEIGHT (grams)	22.4639	22.3498	21.9033	22.4594	22.3780	22.1648
BOTTLE+SAMPLE WEIGHT (grams)	31.9573	29.1058	32.7268	28.0397	32.2523	32.0070	BOTTLE+SAMPLE WEIGHT (grams)	33.5306	32.2620	33.0601	30.5393	33.1406	33.5640
SAMPLE WEIGHT (grams)	9.9924	6.6565	10.3569	5.8938	10.1977	9.7493	SAMPLE WEIGHT (grams)	11.0667	9.9122	11.1768	8.0799	10.7626	11.3992
PERMEATE RATE (gr./hr.)	75.4143	38.9015	73.6857	28.8283	917.7471	4368.2821	PERMEATE RATE (gr./hr.)	73.3704	37.1708	74.1003	29.8335	948.5856	4102.8914
SOLUTE CONC. IN PERMEATE	123.0000	122.0000	121.0000	123.0000	122.0000	121.0000	SOLUTE CONC. IN PERMEATE						
% SOLUTE REJECTION	-4.2373	-3.3898	-2.5424	-4.2373	-3.3898	-2.5424	% SOLUTE REJECTION						

EHR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PHASE- TOLUENE
RUN NO.-
DATE-

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOL/L)- 35
FINAL FEED CONC. (MMOL/L)- 34

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 5
DATE- 16/12/85

PRODUCT RUN ET-HEPTENE
CONC. (MMOL/L) 35

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
RENAME TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	11.5000	11.5000	11.5000	11.5000	0.6667	0.4200
BOTTLE WEIGHT (grams)	22.7058	22.2312	22.1319	22.6244	22.5713	22.0681
BOTTLE+SAMPLE WEIGHT (grams)	36.9842	29.3905	36.1717	28.1805	32.7478	35.9120
SAMPLE WEIGHT (grams)	14.2784	7.1593	14.0398	5.5561	10.1765	13.9039
PERMEATE RATE (gr./hr.)	74.4960	37.3529	73.2511	28.9883	915.8392	1986.2714
SOLUTE CONC. IN PERMEATE	34	34	34	33	34	34
Σ SOLUTE REJECTION	3	3	3	6	3	3

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 6
DATE- 16/12/05

PRODUCT RUN ET-BENZENE
CONC.(MOL/L) 33
34 INITIAL FEED CONC.(MOL/L)
FINAL FEED CONC.(MOL/L) 33

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 7
DATE- 16/12/05

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
REMARKS TYPE	CAR2	CAR1	CTA2	CTA1	PAN3	PAN1	REMARKS TYPE	CAR2	CAR1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	17.5000	17.5000	17.5000	17.5000	1.0000	0.3333	SAMPLE TIME (min.)	16.0000	16.0000	16.0000	16.0000	1.0000	0.3333
BOTTLE WEIGHT (grams)	22.2194	22.1748	22.3540	22.4407	22.0854	22.9189	BOTTLE WEIGHT (grams)	22.3032	22.8372	22.1403	22.7634	22.1556	22.5055
BOTTLE+SAMPLE WEIGHT (grams)	35.1692	28.4184	34.3415	27.2255	30.7293	33.3485	BOTTLE+SAMPLE WEIGHT (grams)	35.3842	28.7411	34.2900	27.3088	31.4598	34.2886
SAMPLE WEIGHT (grams)	12.9498	6.2436	11.9875	4.5848	8.6439	11.3296	SAMPLE WEIGHT (grams)	13.0810	6.1039	12.1497	4.5454	9.3042	11.7831
PENMEATE RATE (gr./hr.)	44.3993	21.4046	41.1000	15.7193	518.6340	2039.3320	PENMEATE RATE (gr./hr.)	49.0538	22.8896	45.5814	17.0433	558.2520	2121.1701
SOLUTE CONC. IN PENMEATE	34	33	34	33	34	34	SOLUTE CONC. IN PENMEATE						
SOLUTE REJECTION	0	3	0	3	0	0	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PHASE-
RUN NO.-
DATE-

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

WORKING PRESS
SYSTEM TEMP.
31 INITIAL FEED CONC (MMOL/L)
FINAL FEED CONC (MMOL/L)

PURE SOLVENT RUN

500 PSI
25 C
29
32

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
RENAME TYPE	CAB2	CAB1	CTA2	CTA1	PMU3	PMU1
SAMPLE TIME (min.)	16.0000	16.0000	16.0000	16.0000	1.0000	0.3333
BOTTLE WEIGHT (grams)	22.7595	22.3621	22.3790	22.3052	22.4820	22.2781
BOTTLE+SAMPLE WEIGHT (grams)	34.7249	28.0724	34.2306	26.5675	30.6530	30.3052
SAMPLE WEIGHT (grams)	11.9654	5.7103	11.8516	4.2623	8.1702	8.0271
PENMEATE RATE (gr./hr.)	44.8703	21.4136	44.4435	15.9836	490.2120	1445.0225
SOLUTE CONC. IN PENMEATE	32	31	32	30	32	31
% SOLUTE REJECTION	-3	0	-3	3	-3	0

ENR - NEPTUNE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 9
DATE- 16/12/85

PRODUCT RUN P-TYLENE
CONC (MOL/L) 38
INITIAL FEED CONC (MOL/L) 38
FINAL FEED CONC (MOL/L) 37

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 25 C

ENR - NEPTUNE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN
WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	
MEMBRANE TYPE	CMB2	CMB1	CTA2	CTA1	PMB3	PMB1	
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	1.1667	0.1700	
BOTTLE WEIGHT (grams)	22.1135	22.1886	22.0576	22.2509	22.0713	22.0646	
BOTTLE+SAMPLE WEIGHT (grams)	35.4006	28.8319	35.7141	27.4976	41.0730	30.8839	
SAMPLE WEIGHT (grams)	13.2873	6.6433	13.6565	5.2467	19.0017	8.8193	
PERMEATE RATE (gr./hr.)	79.7238	39.8598	81.9390	31.4802	977.2024	3112.6941	
SOLUTE CONC. IN PERMEATE	32	32	32	31	32	26	
SOLUTE REJECTION	16	16	16	18	16	32	

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 10
DATE- 17/12/85

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 11
DATE- 17/12/85

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C
29 INITIAL FEED CONC(MOLAR) 25
FINAL FEED CONC(MOLAR)- 32

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CMB2	CMB1	CTA2	CTA1	PMB3	PMB1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	1.0000	0.3333
BOTTLE WEIGHT (grams)	22.7066	22.1492	22.5757	21.9057	22.2223	21.9167
BOTTLE+SAMPLE WEIGHT (grams)	35.9434	28.6167	36.6211	26.9540	39.7462	32.6649
SAMPLE WEIGHT (grams)	13.2368	6.4675	14.0454	5.0483	17.5239	10.7482
PERMEATE RATE (gr./hr.)	79.4208	38.8050	84.2724	30.2898	1051.4340	1934.8695

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CMB2	CMB1	CTA2	CTA1	PMB3	PMB1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.7500	0.3333
BOTTLE WEIGHT (grams)	22.5659	22.5310	21.9520	22.2578	22.5322	22.3092
BOTTLE+SAMPLE WEIGHT (grams)	36.4103	29.1295	36.7808	27.5014	35.7069	33.4864
SAMPLE WEIGHT (grams)	13.8444	6.5985	14.8288	5.2436	13.1747	11.1772
PERMEATE RATE (gr./hr.)	83.0664	39.5910	88.4728	31.4616	1053.9760	2012.0972
SOLUTE CONC. IN PERMEATE	27	28	39	27	34	30
% SOLUTE REJECTION	7	3	-34	7	-17	-3

EHR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.- 12
DATE- 17/12/85

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 500 PSI
25 C
31 INITIAL FEED CONC(MOL/LM)-
FINAL FEED CONC(MOL/LM)- 30
32

EHR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.- 13
DATE- 17/12/85

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 500 PSI
24.5 C

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000	SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000
BOTTLE WEIGHT (grams)	22.2863	21.8698	22.3572	21.9973	22.1812	22.3500	BOTTLE WEIGHT (grams)	22.1075	22.2608	22.3515	22.4015	22.2951	21.9240
BOTTLE+SAMPLE WEIGHT (grams)	35.3388	28.1838	36.4480	26.8264	31.2898	29.2515	BOTTLE+SAMPLE WEIGHT (grams)	35.1238	28.4048	36.2641	27.1323	31.5260	30.3917
SAMPLE WEIGHT (grams)	13.0525	6.2940	14.0908	4.8341	9.1086	6.9015	SAMPLE WEIGHT (grams)	13.0163	6.1440	13.9126	4.7308	9.2309	8.4677
PERMEATE RATE (gr./hr.)	43.5083	20.9800	46.9693	16.1137	546.5160	828.1800	PERMEATE RATE (gr./hr.)	43.3877	20.4800	46.3753	15.7693	553.8540	1016.1240
SOLUTE CONC. IN PERMEATE	33	33	30	30	31	32	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-4	-4	3	3	0	-3	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE -
RUN NO. -
DATE -

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -

PHASE -
RUN NO. -
DATE -

PRODUCT RUN NESTYLENE
CONC. (MOLAR) -
INITIAL FEED CONC. (MOLAR) -
FINAL FEED CONC. (MOLAR) -
WORKING PRESSURE -
SYSTEM TEMP. (avg.) -
500 PSI
25 C
28
29

PURE SOLVENT RUN

CELL #
MEMBRANE
TYPE
SAMPLE
TIME
(min.)
BOTTLE
WEIGHT
(grams)
BOTTLE+SAMPLE
WEIGHT
(grams)
SAMPLE
WEIGHT
(grams)
PERMEATE
RATE
(gr./hr.)
SOLUTE
CONC. IN
PERMEATE
SOLUTE
REJECTION

1.0000 2.0000 3.0000 4.0000 5.0000 6.0000

CA02 CAB1 CTA2 CTA1 PAN3 PAN1

17.0000 17.0000 17.0000 17.0000 1.0000 0.5000

22.2931 22.3700 22.5645 22.0320 21.8730 22.3890

34.8400 28.3029 35.9895 26.6144 31.5048 30.9406

12.5469 5.9329 13.4230 4.5824 9.6318 8.5516

44.2832 20.9396 47.3753 16.1732 577.9080 1026.1920

32 29 30 29 30 29

-10 0 -3 0 -3 0

EMR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 15
 DATE- 17/12/85
 PRODUCT RUN NESTYLENE
 CONC.(MOLAR) 29 INITIAL FEED CONC.(MOLAR)- 28
 FINAL FEED CONC.(MOLAR)- 29
 WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25 C

EMR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 16
 DATE- 17/12/85
 PURE SOLVENT RUN
 SYSTEM TEMP. (avg.)- 25 C
 WORKING PRESSURE- 1000 PSI

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333	SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.6667	0.3333
BOTTLE WEIGHT (grams)	22.4286	21.9946	22.1545	22.1689	22.2717	22.3610	BOTTLE WEIGHT (grams)	22.2105	22.2019	22.1959	22.3586	22.6570	22.5866
BOTTLE+SAMPLE WEIGHT (grams)	34.7512	28.0575	35.9161	27.1488	31.2109	32.4058	BOTTLE+SAMPLE WEIGHT (grams)	34.7165	28.1743	35.8515	27.4128	34.5846	34.9218
SAMPLE WEIGHT (grams)	12.3226	6.0629	13.7616	4.9799	8.9392	10.0448	SAMPLE WEIGHT (grams)	12.0060	5.9724	13.6556	5.0542	11.9276	11.4352
PERMEATE RATE (gr./hr.)	73.9356	36.3774	82.5646	29.8794	1072.7040	1808.2448	PERMEATE RATE (gr./hr.)	72.0360	35.8344	81.9336	30.3252	1073.4303	2058.5419
SOLUTE CONC. IN PERMEATE	28	29	29	27	30	31	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	3	0	0	7	-3	-7	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.) -

WORKING PRESSURE-
SYSTEM TEMP. (avg.) -
34 INITIAL FEED CONC (MMOLAR)
FINAL FEED CONC (MMOLAR)

PHASE- TOLUENE
RUN NO.- 17
DATE- 18/12/85

PRODUCT RUN N-HEPTANE
CONC (MMOLAR)
33
35

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	11.0000	11.0000	11.0000	11.0000	11.0000	11.0000
BOTTLE WEIGHT (grams)	21.8752	22.0582	22.5207	22.2671	22.4923	22.3191
BOTTLE+SAMPLE WEIGHT (grams)	35.1643	28.5065	37.2042	27.5879	30.9288	32.3703
SAMPLE WEIGHT (grams)	13.2891	6.4483	14.6835	5.3208	8.4365	10.0512
PENNEATE RATE (gr./hr.)	72.4860	35.1775	80.0918	29.0225	1012.3800	1809.3969
SOLUTE CONC. IN PENNEATE	39	42	46	37	43	39
% SOLUTE REJECTION	-15	-24	-35	-9	-26	-15

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 18
DATE- 18/12/85

PRODUCT RUN N-HEPTANE
CONC.(MOL/L) 39
INITIAL FEED CONC.(MOL/L) 39
FINAL FEED CONC.(MOL/L) 39
WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 19
DATE- 18/12/85

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C
PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000	17.0000	17.0000	17.0000	17.0000	1.0000	0.3333
BOTTLE WEIGHT (grams)	21.9494	22.1123	22.2438	22.0158	22.1494	22.2390	22.3383	22.1740	22.2481	22.4090	21.9232	21.9309
BOTTLE+SAMPLE WEIGHT (grams)	33.8097	27.8411	34.9730	26.5592	31.1455	29.2320	33.9546	27.7996	34.5500	26.8495	31.0444	26.8544
SAMPLE WEIGHT (grams)	11.8603	5.7288	12.6792	4.5434	8.9961	6.9730	11.6163	5.6236	12.3011	4.4405	9.1192	4.9235
PERMEATE RATE (gr./hr.)	39.5343	19.0940	42.2640	15.1447	539.7460	836.7660	40.9987	19.8480	43.4185	15.6724	547.1520	886.6787
SOLUTE CONC. IN PERMEATE	36	35	44	35	47	45						
SOLUTE REJECTION	8	10	-13	10	-21	-15						

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE- 21
10/12/95

PHASE-
RUN NO.-
DATE-

PRODUCT RUN N-HEPTANE
CONC (MOLAR) 30
INITIAL FEED CONC (MOLAR) 30
FINAL FEED CONC (MOLAR) 29
WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 25 C
1000 PSI

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CM2	CAB1	CTA2	CTA1	PM33	PM1	CM2	CAB1	CTA2	CTA1	PM33	PM1
SAMPLE TIME (min.)	11.0000	11.0000	11.0000	11.0000	0.5000	0.3333						
BOTTLE WEIGHT (grams)	22.3605	22.3500	22.2353	22.2656	22.0862	22.1847						
BOTTLE+SAMPLE WEIGHT (grams)	35.5980	28.8577	34.9667	27.7792	30.7473	30.9485						
SAMPLE WEIGHT (grams)	13.2375	6.5477	14.7254	5.4636	8.6591	8.7638						
PERMEATE RATE (gr./hr.)	72.2045	35.7147	80.3204	29.8015	1039.0920	1577.6418						
SOLUTE CONC. IN PERMEATE	24	22	26	28	32	26						
SOLUTE REJECTION	20	27	13	7	-7	13						

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 22
DATE- 19/12/85

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 23
DATE- 19/12/85

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MO/LAR) 33
FINAL FEED CONC. (MO/LAR) 33

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMA3	PMA1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	21.4731	21.9445	22.2919	22.3700	22.5549	22.2629
BOTTLE+SAMPLE WEIGHT (grams)	33.3006	27.4799	34.4412	26.9973	31.0611	30.2678
SAMPLE WEIGHT (grams)	11.3275	5.5354	12.3493	4.6273	8.5042	8.0049
PERMEATE RATE (gr./hr.)	67.9450	33.2124	74.0958	27.7438	1020.5640	1441.0261

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMA3	PMA1
SAMPLE TIME (min.)	17.0000	17.0000	17.0000	17.0000	1.0000	0.5000
BOTTLE WEIGHT (grams)	22.4355	22.2499	22.2542	22.5393	22.5999	22.2525
BOTTLE+SAMPLE WEIGHT (grams)	34.1112	28.0142	35.2500	27.4014	30.9847	29.0455
SAMPLE WEIGHT (grams)	11.6757	5.7643	12.9958	4.8621	8.3948	6.7930
PERMEATE RATE (gr./hr.)	41.2084	20.3446	45.0675	17.1604	503.6880	815.1600
SOLUTE CONC. IN PERMEATE	32	32	35	31	35	34
SOLUTE REJECTION	3	3	-4	6	-4	-3

EWR - HEPTANE, TOLUENE PROJECT

EWR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 24
DATE- 19/12/85

PRODUCT RUN
METHYL CYCLOHEXANE
CONC (MOL/LM) 33

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 500 PSI
25 C

PURE SOLVENT RUN
DATE- 19/12/85

PHASE- TOLUENE
RUN NO.- 25
DATE- 19/12/85

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 500 PSI
25 C

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMORANDUM							MEMORANDUM						
TYPE	CAB2	CAB1	CTA2	CTA1	PMA3	PMA1	TYPE	CAB2	CAB1	CTA2	CTA1	PMA3	PMA1
SAMPLE	17.0000	17.0000	17.0000	17.0000	1.0000	0.5000	SAMPLE	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000
TIME (min.)							TIME (min.)						
BOTTLE	22.2556	22.2117	22.2472	22.3207	22.1941	22.2622	BOTTLE	22.4927	22.3331	22.1404	22.0150	21.9647	22.4239
WEIGHT (gr ass)							WEIGHT (gr ass)						
BOTTLE+SAMPLE	33.0471	27.4811	33.8324	26.6117	31.1017	28.0243	BOTTLE+SAMPLE	34.7276	28.2418	34.9862	26.7270	29.8560	28.9573
WEIGHT (gr ass)							WEIGHT (gr ass)						
SAMPLE	10.7915	5.2694	11.5852	4.2910	8.9076	5.7621	SAMPLE	12.2349	5.9087	12.8398	4.7120	7.8893	6.5334
WEIGHT (gr ass)							WEIGHT (gr ass)						
PERMEATE	38.0876	18.5979	40.8889	15.1447	534.4560	691.4520	PERMEATE	40.7830	19.6957	42.7993	15.7067	473.3580	784.0080
RATE (gr./hr.)							RATE (gr./hr.)						
SOLUTE	33	33	33	30	34	32	SOLUTE						
CONC. IN PERMEATE							CONC. IN PERMEATE						
SOLUTE REJECTION	0	0	0	9	-3	3	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 26
DATE- 30/12/85

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 27
DATE- 30/12/85

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR) 24
FINAL FEED CONC. (MMOLAR) 21

PRODUCT RUN CYCLOHEXANE
CONC. (MMOLAR) 23

CELL #	1	2	3	4	5	6
HEPTANE TYPE	CAR2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000
BOTTLE WEIGHT (grams)	22.0524	22.3367	22.2976	22.0424	22.0606	22.1428
BOTTLE+SAMPLE WEIGHT (grams)	34.3388	28.2500	35.0935	26.4280	30.9675	28.2725
SAMPLE WEIGHT (grams)	12.2864	5.9133	12.7959	4.5856	8.9069	6.1297
PERMEATE RATE (gr./hr.)	40.9547	19.7110	42.6530	15.2853	534.4140	735.5640

CELL #	1	2	3	4	5	6
HEPTANE TYPE	CAR2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	19.0000	19.0000	19.0000	19.0000	1.0000	0.5000
BOTTLE WEIGHT (grams)	22.0644	22.4498	22.3947	22.0475	22.2615	22.5582
BOTTLE+SAMPLE WEIGHT (grams)	35.4485	28.8182	36.3729	27.0548	31.9551	29.4028
SAMPLE WEIGHT (grams)	13.3821	6.3684	13.9787	5.0093	9.6936	6.8446
PERMEATE RATE (gr./hr.)	42.2593	20.1107	44.1417	15.8188	581.6160	821.3520
SOLUTE CONC. IN PERMEATE	23	21	21	18	23	23
% SOLUTE REJECTION	0	0	0	14	-10	-10

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PRODUCT RUN CYCLOHEPTANE
CONC (MOLAR) 23 INITIAL FEED CONC (MOLAR)
24
21
FINAL FEED CONC (MOLAR)

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
1000 PSI
25 C

ENR - HEPTANE, TOLUENE PROJECT

PURE SOLVENT RUN
WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

1.0000 2.0000 3.0000 4.0000 5.0000 6.0000

CAB2 CAB1 CTA2 CTA1 PM3 PM1

CELL #
RENAME
TYPE
SAMPLE
TIME
(min.)
BOTTLE
WEIGHT
(grams)
BOTTLE+SAMPLE
WEIGHT
(grams)
SAMPLE
WEIGHT
(grams)
PERMEATE
RATE
(gr./hr.)

1.0000 2.0000 3.0000 4.0000 5.0000 6.0000
CAB2 CAB1 CTA2 CTA1 PM3 PM1
10.0000 10.0000 10.0000 10.0000 0.5000 0.3333
22.3164 22.2093 22.1389 21.9026 22.1919 22.0492
34.3131 28.1140 35.2881 26.7990 30.9453 29.5964
11.9967 5.9047 13.1492 4.8964 8.7534 7.5472
71.9802 35.4282 78.8952 29.3784 1050.4080 1358.6319

22 21 23 22 23 22
4 9 0 4 0 4

SOLUTE
CONC. IN
PERMEATE
SOLUTE
REJECTION

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.- 29
DATE- 30/12/05

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.- 30
DATE- 30/12/05

PRODUCT RUN 2,2-DIMETHYLBUTANE
CONC. (MMOLAR) 32

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR) 35
FINAL FEED CONC. (MMOLAR)- 30

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	22.2859	22.1676	21.8625	22.2806	22.4534	22.2946
BOTTLE+SAMPLE WEIGHT (grams)	33.8141	27.8289	34.5745	27.0818	31.0599	30.2160
SAMPLE WEIGHT (grams)	11.5282	5.6613	12.7120	4.8012	8.6065	7.9214
PERMEATE RATE (gr./hr.)	49.1692	33.9978	76.2720	26.8072	1032.7800	1425.9946

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	22.1451	22.2823	22.2224	22.0703	22.3726	21.8089
BOTTLE+SAMPLE WEIGHT (grams)	33.6106	27.9493	34.9332	26.8503	32.6331	29.9504
SAMPLE WEIGHT (grams)	11.4655	5.6670	12.7108	4.7800	10.2605	8.1415
PERMEATE RATE (gr./hr.)	68.7930	34.0020	76.2648	28.4800	1231.2600	1465.6166
SOLUTE CONC. IN PERMEATE	39	33	35	31	36	35
% SOLUTE REJECTION	-22	-3	-9	3	-13	-9

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PRODUCT RUN 2,2-DIMETHYLBUTYLENE
CONC.(WOL.%)

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN
SYSTEM TEMP. (avg.)-

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #

MEMBRANE
TYPE

SAMPLE
TIME
(min.)

BOTTLE
HEIGHT
(grams)

BOTTLE+SAMPLE
HEIGHT
(grams)

SAMPLE
HEIGHT
(grams)

PENETRATE
RATE
(gr./hr.)

SOLUTE
CONC. IN
PENETRATE

SOLUTE
REJECTION

1.0000

CAR2

18.0000

22.2128

33.4811

11.3134

37.7113

34

-6

2.0000

CAR1

18.0000

22.2128

27.7082

5.4954

18.3180

35

-9

3.0000

CTA2

18.0000

21.9152

33.9567

12.0415

40.1383

34

-6

4.0000

CTA1

18.0000

22.0494

26.5304

4.4815

14.9383

31

3

5.0000

PAM3

1.0000

22.0483

30.7563

8.7080

522.4800

35

-9

6.0000

PAM1

0.5000

22.0841

27.7319

5.6478

677.7360

33

-3

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 32
DATE- 31/12/85

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 33
DATE- 31/12/85

PRODUCT RUN HEPTANE
CONC. (MMOLAR) 33

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR) 33
FINAL FEED CONC. (MMOLAR)- 33

CELL #	1	2	3	4	5	6
RENAME TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000
BOTTLE WEIGHT (gr ams)	22.2401	21.4373	21.8559	21.8458	22.3197	22.0061
BOTTLE+SAMPLE WEIGHT (gr ams)	35.1482	28.1302	35.2840	26.7973	32.3264	28.3167
SAMPLE WEIGHT (gr ams)	12.9081	6.1929	13.4281	4.9515	10.0067	6.3106
PERMEATE RATE (gr./hr.)	43.0270	20.6430	44.7463	16.5050	600.4020	757.2720

CELL #	1	2	3	4	5	6
RENAME TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000
BOTTLE WEIGHT (gr ams)	22.4628	22.1953	22.4000	22.0215	22.0784	22.0462
BOTTLE+SAMPLE WEIGHT (gr ams)	34.7372	28.0953	35.1921	26.7140	30.8652	28.1790
SAMPLE WEIGHT (gr ams)	12.2744	5.9000	12.7921	4.6925	8.7868	6.1328
PERMEATE RATE (gr./hr.)	40.9147	19.6667	42.6403	15.6417	527.2080	735.9340
SOLUTE CONC. IN PERMEATE	33	32	33	31	33	34
SOLUTE REJECTION	0	3	0	6	0	-3

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 34
DATE- 31/12/85

PRODUCT RUN HEPTANE
CONC.(MOL/LR)
33
33

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
33 INITIAL FEED CONC.(MOL/LR)
FINAL FEED CONC.(MOL/LR)

1000 PSI
25 C

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 35
DATE- 31/12/85

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
1000 PSI
25 C

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333	SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	22.0106	22.1066	22.3563	22.0614	21.9152	21.8045	BOTTLE WEIGHT (grams)	22.3498	21.9308	22.2696	22.1226	22.6199	22.5648
BOTTLE+SAMPLE WEIGHT (grams)	33.7586	27.8950	33.2596	26.9305	30.6919	28.1991	BOTTLE+SAMPLE WEIGHT (grams)	34.0994	27.5336	35.3177	26.9817	30.7870	29.0844
SAMPLE WEIGHT (grams)	11.7480	5.7844	12.9033	4.8691	8.7767	6.3946	SAMPLE WEIGHT (grams)	11.7496	5.6078	13.0481	4.8591	8.1671	6.5196
PERMEATE RATE (gr./hr.)	70.4880	34.7184	77.4198	29.2146	1053.2040	1151.1431	PERMEATE RATE (gr./hr.)	70.4976	33.6168	78.2886	29.1546	980.8520	1173.6454
SOLUTE CONC. IN PERMEATE	34	33	33	33	34	33	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-3	0	0	0	-3	0	SOLUTE REJECTION						

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 36
DATE- 2/1/86

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 24 C

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 37
DATE- 2/1/86

PRODUCT RUN METHANOL
CONC. (MMOL/L) 37
WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED MC. (MMOL/L) 32
FINAL FEED CONC. (MMOL/L)- 42

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (gr ass)	22.3478	22.3951	21.9191	22.0757	22.7444	22.4544
BOTTLE+SAMPLE WEIGHT (gr ass)	33.2175	27.7559	34.0641	26.5760	29.9941	28.1824
SAMPLE WEIGHT (gr ass)	10.8697	5.3608	12.1450	4.5003	7.2497	5.7280
PERMEATE RATE (gr./hr.)	45.2182	32.1648	72.8700	27.0018	849.8440	1031.1431

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (gr ass)	22.2739	22.2780	21.9747	21.9900	22.2432	22.7127
BOTTLE+SAMPLE WEIGHT (gr ass)	32.8570	27.5017	34.5054	26.9651	30.2590	28.5094
SAMPLE WEIGHT (gr ass)	10.5831	5.2237	12.5307	4.9951	8.0158	5.7967
PERMEATE RATE (gr./hr.)	63.4986	31.3422	75.1842	29.9706	961.8960	1043.5104
SOLUTE CONC. IN PERMEATE	42	32	45	42	39	35
SOLUTE REJECTION	-14	14	-22	-14	-5	5

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 38
DATE- 2/1/86

PRODUCT RUN METHANOL
CONC.(MOLAR) 37
INITIAL FEED CONC.(MOLAR) 32
FINAL FEED CONC.(MOLAR) 42

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 24.5 C

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 39
DATE- 2/1/86

PURE SOLVENT RUN
WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 23.5 C

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	19.0000	19.0000	19.0000	19.0000	1.0000	0.5000
BOTTLE WEIGHT (grams)	22.0472	22.2223	22.0823	22.2703	22.3345	22.4178
BOTTLE+SAMPLE WEIGHT (grams)	33.5197	27.6514	34.3574	26.6833	30.6046	27.2407
SAMPLE WEIGHT (grams)	11.4725	5.4291	12.4751	4.4130	8.2701	4.8229
PERMEATE RATE (gr./hr.)	36.2289	17.1445	39.3951	13.9358	496.2060	578.7480
SOLUTE CONC. IN PERMEATE	18	28	32	25	35	25
SOLUTE REJECTION	51	24	14	32	5	32

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000
BOTTLE WEIGHT (grams)	22.4123	22.4037	22.2510	22.2468	22.1793	22.6004
BOTTLE+SAMPLE WEIGHT (grams)	34.0227	28.0266	34.5790	26.8657	30.8531	28.3759
SAMPLE WEIGHT (grams)	11.6104	5.6229	12.3280	4.6189	8.6738	5.7755
PERMEATE RATE (gr./hr.)	38.7013	18.7430	41.0933	15.3963	520.4280	693.0600

EHR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -

500 PSI
24 C
INITIAL FEED CONC. (MMOLAR) - 20
FINAL FEED CONC. (MMOLAR) - 34

PHASE - TOLUENE
RUN NO. - 40
DATE - 2/1/86

PRODUCT RUN ANILINE
CONC. (MMOLAR) 36

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000
BOTTLE WEIGHT (grams)	22.2721	21.9593	22.3387	22.1449	22.5398	22.1256
BOTTLE+SAMPLE WEIGHT (grams)	33.4949	27.3795	34.1836	26.5447	30.8757	27.3105
SAMPLE WEIGHT (grams)	11.2228	5.4202	11.7749	4.3998	8.3359	5.1849
PERMEATE RATE (gr./hr.)	37.4093	18.0673	39.4830	14.6660	500.1540	622.1880
SOLUTE CONC. IN PERMEATE	35	34	34	35	33	33
SOLUTE REJECTION	3	6	6	3	8	8

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 41
 DATE- 2/1/86
 WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25 C
 36 INITIAL FEED CONC.(MOL/LM)
 FINAL FEED CONC.(MOL/LM)-

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
 RUN NO.-
 DATE-
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)
 PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
RENAME	CAR2	CAB1	CTA2	CTA1	PAN3	PAN1	RENAME	CAR2	CAB1	CTA2	CTA1	PAN3	PAN1
TYPE							TYPE						
SAMPLE	10.0000	10.0000	10.0000	10.0000	0.5600	0.3333	SAMPLE						
TIME							TIME						
(min.)							(min.)						
BOTTLE	22.2004	21.9279	22.0488	22.4035	21.9835	22.4814	BOTTLE						
WEIGHT							WEIGHT						
(grams)							(grams)						
BOTTLE+SAMPLE	33.1140	27.2765	34.3843	27.1329	29.9533	28.4855	BOTTLE+SAMPLE						
WEIGHT							WEIGHT						
(grams)							(grams)						
SAMPLE	10.9136	5.5486	12.3355	4.7294	7.9718	6.2041	SAMPLE						
WEIGHT							WEIGHT						
(grams)							(grams)						
PERMEATE	65.4816	32.0916	74.0130	28.3744	956.6160	1116.8497	PERMEATE						
RATE							RATE						
(gr./hr.)							(gr./hr.)						
SOLUTE	35	33	36	36	35	35	SOLUTE						
CONC. IN							CONC. IN						
PERMEATE							PERMEATE						
1	3	8	0	0	3	3	1						
SOLUTE							SOLUTE						
REJECTION							REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 42
 DATE- 3/1/86

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 43
 DATE- 3/1/86

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25 C
 INITIAL FEED CONC. (MMOLAR) 33
 FINAL FEED CONC. (MMOLAR) 29

PRODUCT RUN HEPTANE
 CONC. (MMOLAR) 31

CELL #	1	2	3	4	5	6
MEMORANDUM TYPE	CAB 2	CAB 1	CTA 2	CTA 1	PAN 3	PAN 1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	22.1934	22.3167	21.8537	21.9297	21.7790	22.0621
BOTTLE+SAMPLE WEIGHT (grams)	33.0710	27.6177	33.9721	26.5717	29.7593	28.2659
SAMPLE WEIGHT (grams)	10.8776	5.3010	12.1184	4.6420	7.9803	6.2038
PERMEATE RATE (gr./hr.)	65.2656	31.8060	72.7104	27.8520	957.6360	1116.7957

CELL #	1	2	3	4	5	6
MEMORANDUM TYPE	CAB 2	CAB 1	CTA 2	CTA 1	PAN 3	PAN 1
SAMPLE TIME (min.)	11.0000	11.0000	11.0000	11.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	22.3817	22.2952	22.0584	22.1676	22.0341	22.3292
BOTTLE+SAMPLE WEIGHT (grams)	34.5107	28.2048	35.6593	27.3880	30.2758	29.0455
SAMPLE WEIGHT (grams)	12.1290	5.9116	13.6009	5.2204	8.2417	6.7163
PERMEATE RATE (gr./hr.)	66.1582	32.2451	74.1867	28.4745	1209.0549	1209.0549
SOLUTE CONC. IN PERMEATE	32	32	28	39	30	33
SOLUTE REJECTION	-3	-3	10	-26	3	-6

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 44
 DATE- 3/1/86
 PRODUCT RUN HEPTANE
 CONC.(MOL/LR) 33.0000
 FINAL FEED CONC.(MOL/LR) 29.0000
 WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 24.5 C
 31 INITIAL FEED CONC.(MOL/LR)

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 45
 DATE- 3/1/86
 PURE SOLVENT RUN
 WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 25 C

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMORANDUM							MEMORANDUM						
TYPE							TYPE						
SAMPLE							SAMPLE						
TIME							TIME						
(min.)							(min.)						
BOTTLE							BOTTLE						
WEIGHT							WEIGHT						
(grams)							(grams)						
BOTTLE+SAMPLE							BOTTLE+SAMPLE						
WEIGHT							WEIGHT						
(grams)							(grams)						
SAMPLE							SAMPLE						
WEIGHT							WEIGHT						
(grams)							(grams)						
PENMEATE							PENMEATE						
DATE							DATE						
(gr./hr.)							(gr./hr.)						
SOLUTE							SOLUTE						
CONC. IN							CONC. IN						
PENMEATE							PENMEATE						
1							1						
SOLUTE							SOLUTE						
REJECTION							REJECTION						
1							1						
SOLUTE							SOLUTE						
REJECTION							REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -

500 PSI
25 C

INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)

PRODUCT RUN BIPHENYL
CONC. (MMOLAR)

38

DATE - 3/1/86

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

PHASE - TOLUENE
RUN NO. - 46
DATE - 3/1/86

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -

500 PSI
25 C

INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)

PRODUCT RUN BIPHENYL
CONC. (MMOLAR)

38

DATE - 3/1/86

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000
BOTTLE WEIGHT (grams)	21.9639	22.4892	22.3375	22.4231	22.2460	22.2270
BOTTLE+SAMPLE WEIGHT (grams)	33.0737	27.8406	34.1452	26.8857	30.7050	27.8457
SAMPLE WEIGHT (grams)	11.1098	5.3514	11.8077	4.4626	8.4590	5.6187
PERMEATE RATE (gr./hr.)	37.0327	17.8280	39.3590	14.8753	507.5400	674.2440
SOLUTE CONC. IN PERMEATE	28	27	33	30	34	37
SOLUTE REJECTION	26	28	13	21	11	3

EMR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 47
DATE- 3/1/86

PRODUCT RUN DIPHENYL
CONC. (MMOL/L)

WORKING PRESSURE- SYSTEM TEMP (avg.)	1000 PSI 25 C
30 INITIAL FEED CONC (MMOLAR)	
FINAL FEED CONC (MMOLAR)	

ENR - HEPTANE, TOLUENE PROJECT

PHASE -
RUN NO. -
DATE -

PURE SOLVENT RUM

WORKING PRESSURE-

CELL #	CAB2	CAB1	CIB2	CTA1	PAN3	PAN1	CELL #	CAB2	CAB1	CTA1	PAN3	PAN1
REMARKS TYPE							MEMBRANE TYPE					
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333	SAMPLE TIME (min.)	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (gr aas)	22.1970	22.2905	22.2986	22.2558	22.4716	22.0830	BOTTLE WEIGHT (gr aas)	22.1970	22.2905	22.2558	22.4716	22.0830
BOTTLE+SAMPLE WEIGHT (gr aas)	33.2115	27.6641	34.6087	26.9473	30.5661	28.6116	BOTTLE+SAMPLE WEIGHT (gr aas)	33.2115	27.6641	26.9473	30.5661	28.6116
SAMPLE WEIGHT (gr aas)	11.0145	5.3736	12.3101	4.6915	7.8945	6.5286	SAMPLE WEIGHT (gr aas)	11.0145	5.3736	12.3101	4.6915	6.5286
PERMEATE RATE (gr./hr.)	66.0870	32.2416	73.8606	28.1490	947.7400	1175.2655	PERMEATE RATE (gr./hr.)	66.0870	32.2416	73.8606	947.7400	1175.2655
SOLUTE CONC. IN PERMEATE	32	32	34	34	36	34	SOLUTE CONC. IN PERMEATE	32	32	34	36	34
% SOLUTE REJECTION	16	16	11	11	5	11	% SOLUTE REJECTION	16	16	11	5	11

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 48
DATE- 6/1/86

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

WORKING PRESSURE- 1000 F
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 49
DATE- 6/1/86

PRODUCT RUN NAPHTHALENE
CONC. (MMOLAR) 41

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	22.2133	21.9729	22.4302	22.2229	22.2767	21.9896
BOTTLE+SAMPLE WEIGHT (grams)	33.1594	27.2577	34.4408	26.8669	30.1133	28.5110
SAMPLE WEIGHT (grams)	10.9461	5.2848	12.0106	4.6440	7.8366	6.5214
PERMEATE RATE (gr./hr.)	65.6766	31.7088	72.0636	27.8640	940.3920	1173.9694

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	22.1638	21.9198	22.3065	22.0492	22.3416	22.1036
BOTTLE+SAMPLE WEIGHT (grams)	33.3140	27.3170	34.6442	26.8300	30.8487	28.9361
SAMPLE WEIGHT (grams)	11.1502	5.3972	12.3377	4.7808	8.5071	6.8325
PERMEATE RATE (gr./hr.)	66.9012	32.3832	74.0262	28.6848	1020.8520	1229.9730
SOLUTE CONC. IN PERMEATE	36	38	36	36	38	37
% SOLUTE REJECTION	12	7	12	12	7	10

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 50
DATE- 6/1/86

PRODUCT RUN NAPHTHALENE
CONC (MMOLAR) 41 INITIAL FEED CONC (MMOLAR) 40
FINAL FEED CONC (MMOLAR) 42

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.-
DATE-

PURE SOLVENT RUN
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000
BOTTLE WEIGHT (grams)	21.9384	22.0229	22.0959	22.1490	22.4832	22.3696
BOTTLE+SAMPLE WEIGHT (grams)	32.9749	27.2904	34.0101	26.6215	31.0134	27.7549
SAMPLE WEIGHT (grams)	11.0385	5.2875	11.9142	4.4725	8.5502	5.3853
PERMEATE RATE (gr./hr.)	36.7950	17.5583	39.7140	14.9083	511.8120	646.2360
SOLUTE CONC. IN PERMEATE	37	40	37	36	38	39
SOLUTE REJECTION	10	2	10	12	7	5

EMR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 51
DATE- 7/1/86

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 52
DATE- 7/1/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C
INITIAL FEED CONC. (MMOLAR) 23
FINAL FEED CONC. (MMOLAR)- 26

PRODUCT RUN HEPTANE
CONC. (MMOLAR) 25

CELL #

MEMBRANE
TYPE

SAMPLE
TIME
(min.)

BOTTLE
WEIGHT
(grams)

BOTTLE+SAMPLE
WEIGHT
(grams)

SAMPLE
WEIGHT
(grams)

PERMEATE
RATE
(gr./hr.)

CELL #

MEMBRANE
TYPE

SAMPLE
TIME
(min.)

BOTTLE
WEIGHT
(grams)

BOTTLE+SAMPLE
WEIGHT
(grams)

SAMPLE
WEIGHT
(grams)

PERMEATE
RATE
(gr./hr.)

SOLUTE
CONC. IN
PERMEATE

SOLUTE
REJECTION

1,0000

CAB2

18,0000

22,6111

33,8316

11,2205

37,4017

2,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

3,0000

CTA2

18,0000

22,1233

33,8072

11,6839

38,9463

4,0000

CTA1

18,0000

22,4803

26,6581

4,1778

13,9260

5,0000

PAN1

18,0000

22,0409

30,3443

8,3034

498,2040

6,0000

PAN1

0,5000

22,4907

27,9880

5,4973

659,6760

5,0000

PAN3

1,0000

22,0409

30,3443

8,3034

498,2040

1,0000

PAN3

1,0000

22,0409

30,3443

8,3034

498,2040

1,0000

PAN3

1,0000

22,0409

30,3443

8,3034

498,2040

18,0000

CAB2

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB2

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB2

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB2

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB2

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

18,0000

CAB1

18,0000

22,0960

27,3765

5,2797

17,5990

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE - TOLUENE
RUN NO. - 53
DATE - 7/1/86

PHASE -
RUN NO. -
DATE -

WORKING PRESSURE - 1000 PSI
SYSTEM TEMP. (AVG.) - 25 C
PRODUCT RUN HEPTANE
CONC.(MOLAL) 25 INITIAL FEED CONC. (F1) - 23
FINAL FEED CONC. (F2) - 26

WORKING PRESSURE -
SYSTEM TEMP. (AVG.) -

PURE SOLVENT RUN

CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000	CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	10,0000	10,0000	10,0000	10,0000	0,5000	0,3333	SAMPLE TIME (min.)	10,0000	10,0000	10,0000	10,0000	0,5000	0,3333
BOTTLE WEIGHT (grams)	22,5167	22,0155	22,1882	22,0035	22,2429	22,3733	BOTTLE WEIGHT (grams)	22,5167	22,0155	22,1882	22,0035	22,2429	22,3733
BOTTLE+SAMPLE WEIGHT (grams)	33,5630	27,2733	34,5520	26,4575	29,9823	29,1920	BOTTLE+SAMPLE WEIGHT (grams)	33,5630	27,2733	34,5520	26,4575	29,9823	29,1920
SAMPLE WEIGHT (grams)	10,9863	5,2578	12,3638	4,4540	7,7394	6,8187	SAMPLE WEIGHT (grams)	10,9863	5,2578	12,3638	4,4540	7,7394	6,8187
PERMEATE RATE (gr./hr.)	65,9178	31,5468	74,1828	26,7240	928,7280	1227,4887	PERMEATE RATE (gr./hr.)	65,9178	31,5468	74,1828	26,7240	928,7280	1227,4887
SOLUTE CONC. IN PERMEATE	22	24	25	26	25	25	SOLUTE CONC. IN PERMEATE	22	24	25	26	25	25
SOLUTE REJECTION	12	4	0	-4	0	0	SOLUTE REJECTION	12	4	0	-4	0	0

EMG - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PHASE- TOLUENE
RUN NO.- 54
DATE- 7/1/86

PURE SOLVENT RUN

EMG - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 55
DATE- 7/1/86

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR) 42
FINAL FEED CONC. (MMOLAR) 46

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	22.0324	22.3578	21.8568	22.6265	22.2497	22.2285
BOTTLE+SAMPLE WEIGHT (grams)	34.3917	28.3169	35.7720	27.7676	30.1256	29.0270
SAMPLE WEIGHT (grams)	12.3593	5.9591	13.9152	5.1411	7.8759	6.7985
PERMEATE RATE (gr./hr.)	74.1558	35.7546	83.4912	31.9466	945.1980	1223.8524

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	22.2077	22.6064	22.2817	22.2212	21.8949	22.2625
BOTTLE+SAMPLE WEIGHT (grams)	33.1977	27.8744	34.7750	26.8395	30.0536	29.0438
SAMPLE WEIGHT (grams)	11.3510	5.2680	12.4403	4.6183	8.1587	6.7813
PERMEATE RATE (gr./hr.)	65.5400	31.6080	74.6598	27.1150	379.0440	1220.7561
SOLUTE CONC. IN PERMEATE	38	41	46	39	43	45
SOLUTE REJECTION	16	9	-2	13	4	0

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE- 7/1/86

TOLUENE
56 PRODUCT RUN 2-METHYL NAPHTHALENE
CONC. (MOLAR) 45

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 500 PSI
INITIAL FEED CONC. (MOLAR) 25 C
FINAL FEED CONC. (MOLAR) 43 45

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

PHASE-
RUN NO.-
DATE-

CELL #
RENAME
TYPE
SAMPLE
TIME
(min.)
BOTTLE
WEIGHT
(grams)
BOTTLE+SAMPLE
WEIGHT
(grams)
SAMPLE
WEIGHT
(grams)
PERMEATE
RATE
(gr./hr.)

1.0000 2.0000 3.0000 4.0000 5.0000 6.0000
CAB2 CAB1 CTA2 CTA1 PAK3 PAK1

18.0000 18.0000 18.0000 18.0000 1.0000 0.5000
22.2452 22.2764 22.4182 22.2157 22.2629 22.0311
32.8518 27.2195 34.0911 26.4428 30.3682 27.1465
10.6066 4.9431 11.6729 4.2271 8.1253 5.1154
35.3553 16.4770 38.9097 14.0903 487.5180 613.8480
42 43 44 43 43 45
7 4 2 4 4 0

SOLUTE
CONC. IN
PERMEATE
2
SOLUTE
EXTRACTION

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 57.0000
DATE- 8/1/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 58.0000
DATE- 8/1/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C
INITIAL FEED CONC. (MMOLAR) 30.0000
FINAL FEED CONC. (MMOLAR) 35.0000

PRODUCT RUN DIBENZYLAMINE
CONC. (MMOLAR) 30.0000

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	18.0000	18.0000	18.0000	18.0000	1.0000	0.5000
BOTTLE WEIGHT (grams)	22.2652	22.3535	22.3855	21.8568	22.1567	22.1041
BOTTLE+SAMPLE WEIGHT (grams)	32.9624	27.4469	33.6783	25.9983	29.7428	26.9134
SAMPLE WEIGHT (grams)	10.6972	5.0934	11.2928	4.1415	7.5841	4.8093
PERMEATE RATE (gr./hr.)	35.6573	16.9780	37.6427	13.8850	455.1660	577.1140
SOLUTE CONC. IN PERMEATE	36.0000	36.0000	36.0000	35.0000	32.0000	37.0000
SOLUTE REJECTION	-20.0000	-20.0000	-20.0000	-16.6667	-6.6667	-23.3333

EMR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 59.0000 PRODUCT RUN DIBENZYLAMINE
 DATE- 8/1/86 CONC. (MMOLAR) 35
 WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25 C
 INITIAL FEED CONC. (MMOLAR) 37.0000
 FINAL FEED CONC. (MMOLAR) 36.0000

EMR - HEPTANE, TOLUENE PROJECT

PHASE-
 RUN NO.-
 DATE-
 PURE SOLVENT RUN
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-
 TEMP. CORR. FACTOR-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.3333
BOTTLE WEIGHT (grams)	22.2769	22.3859	22.4023	22.2322	22.0407	22.2817
BOTTLE+SAMPLE WEIGHT (grams)	32.9118	27.5353	34.4045	26.6485	29.4948	28.1760
SAMPLE WEIGHT (grams)	10.6149	5.1494	12.0022	4.4363	7.4541	5.8943
PERMEATE RATE (gr./hr.)	63.6894	30.8964	72.0132	26.6178	894.4920	1061.0801
SOLUTE CONC. IN PERMEATE	36.0000	28.0000	37.0000	38.0000	37.0000	37.0000
SOLUTE REJECTION	2.7027	24.3243	0.0000	-2.7027	0.0000	0.0000

EHR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 1000 PSI
SYSTEM TEMP. (avg.) - 25 C

PHASE - TOLUENE
RUN NO. - 60
DATE - 8/11/86

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 1000 PSI
SYSTEM TEMP. (avg.) - 25 C
INITIAL FEED CONC. (MMOLAR) - 38
FINAL FEED CONC. (MMOLAR) - 37

PHASE - TOLUENE
RUN NO. - 61
DATE - 8/11/86

PRODUCT RUN OCTYLAMINE
CONC. (MMOLAR) 38

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.5000
BOTTLE WEIGHT (grams)	22.2523	22.4001	22.5679	22.2841	22.0555	22.2513
BOTTLE+SAMPLE WEIGHT (grams)	32.4545	27.2868	34.5464	26.7563	29.0545	29.1122
SAMPLE WEIGHT (grams)	10.2022	4.8867	11.9785	4.4722	6.9990	6.8609
PERMEATE RATE (gr./hr.)	61.2132	29.3202	71.8710	26.8332	839.8800	823.3080
SOLUTE CONC. IN PERMEATE	33	35	30	35	42	37
SOLUTE REJECTION	13	8	21	8	-11	3

EHR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

TOLUENE
62 PRODUCT RUN UCTYLAMINE
8/1/86 CONC. (MMOLAR) 38

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (MMOLAR) 38
FINAL FEED CONC. (MMOLAR) 37

500 PSI
25 C

EHR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #

MEMBRANE
TYPE

SAMPLE
TIME
(min.)

BOTTLE
WEIGHT
(grams)

BOTTLE+SAMPLE
WEIGHT
(grams)

SAMPLE
WEIGHT
(grams)

PERMEATE
RATE
(gr./hr.)

SOLUTE
CONC. IN
PERMEATE

SOLUTE
REJE

1.0000

CAB2

19.0000

22.3287

32.8450

10.5163

33.2094

35

1.0000

CAB1

19.0000

22.2852

27.2863

5.0011

15.7929

36

3.0000

CTA2

19.0000

22.1000

34.0294

11.9294

37.6718

36

4.0000

CTA1

19.0000

21.9670

26.3967

4.4297

13.9885

38

5.0000

PAN3

1.0000

22.4678

29.5972

7.1294

427.7640

36

6.0000

PAN1

1.0000

22.0828

28.5434

6.4606

387.6360

36

3.0000

CTA2

1.0000

2.0000

4.0000

5.0000

6.0000

1.0000

CAB2

2.0000

3.0000

4.0000

5.0000

6.0000

1.0000

CAB1

2.0000

3.0000

4.0000

5.0000

6.0000

3.0000

CTA1

4.0000

5.0000

6.0000

7.0000

8.0000

4.0000

CTA2

5.0000

6.0000

7.0000

8.0000

9.0000

5.0000

PAN3

6.0000

7.0000

8.0000

9.0000

10.0000

6.0000

PAN1

7.0000

8.0000

9.0000

10.0000

11.0000

7.0000

CTA1

8.0000

9.0000

10.0000

11.0000

12.0000

8.0000

CAB2

9.0000

10.0000

11.0000

12.0000

13.0000

9.0000

CAB1

10.0000

11.0000

12.0000

13.0000

14.0000

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 63
 DATE- 9/1/86

WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 64
 DATE- 9/1/86

PRODUCT RUN N-PROPYL BENZENE
 CONC. (MMOLAR) 33

WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 24.5 C
 INITIAL FEED CONC. (MMOLAR) 33
 FINAL FEED CONC. (MMOLAR) 33

CELL #	1	2	3	4	5	6
HEPTANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	19.0000	19.0000	19.0000	19.0000	1.0000	1.0000
BOTTLE WEIGHT (grams)	22.4385	21.7873	21.9334	22.0261	22.5159	21.9566
BOTTLE+SAMPLE WEIGHT (grams)	33.4978	27.0274	33.6737	26.4407	29.8677	29.6684
SAMPLE WEIGHT (grams)	11.0593	5.2401	11.7403	4.4146	7.3518	7.7118
PERMEATE DATE (gr./hr.)	34.9241	16.5477	37.0746	13.9408	441.1080	462.7080

CELL #	1	2	3	4	5	6
HEPTANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	19.0000	19.0000	19.0000	19.0000	1.0000	1.0000
BOTTLE WEIGHT (grams)	22.3037	22.0301	22.0449	22.2391	22.0280	21.8113
BOTTLE+SAMPLE WEIGHT (grams)	33.6556	27.4307	34.2080	26.7881	29.4248	30.0967
SAMPLE WEIGHT (grams)	11.3519	5.4006	12.1631	4.5490	7.3968	8.2854
PERMEATE RATE (gr./hr.)	35.8481	17.0545	38.4098	14.3653	443.8080	497.1240
SOLUTE CONC. IN PERMEATE	32	32	32	30	34	33
% SOLUTE REJECTION	3	3	3	9	-3	0

EMR - HEPTANE, TOLUENE PROJECT

PHASE -
RUN NO. -
DATE -

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)

PHASE -
RUN NO. -
DATE -

PURE SOLVENT RUN
WORKING PRESSURE -
SYSTEM TEMP. (avg.) -

EMR - HEPTANE, TOLUENE PROJECT

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PMK1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMK3	PMK1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.5000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.0863	22.1476	21.8995	22.3150	22.1547	22.2065	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	32.7137	27.2697	33.9261	26.8367	29.1235	28.7329	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	10.6274	5.1221	12.0246	4.5217	6.9688	6.5264	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	63.7644	30.7326	72.1596	27.1302	836.2560	783.1680	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	33	32	33	33	33	33	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0	3	0	0	0	0	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 66
DATE- 9/1/86

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 67
DATE- 9/1/86

PRODUCT RUN N-BUTYL BENZENE
CONC. (MOLAR) 34

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C
INITIAL FEED CONC. (MOLAR) 33
FINAL FEED CONC. (MOLAR) 35

CELL #
MEMBRANE TYPE
SAMPLE TIME (min.)
BOTTLE WEIGHT (grams)
BOTTLE+SAMPLE WEIGHT (grams)
SAMPLE WEIGHT (grams)
PERMEATE RATE (gr./hr.)

1.0000 2.0000 3.0000 4.0000 5.0000 6.0000
CAB2 CAB1 CTA2 CTA1 PAM3 PAM1
10.0000 10.0000 10.0000 10.0000 0.5000 0.5000
22.2347 22.4885 22.1551 22.1176 21.9245 21.8307
31.8701 27.1375 33.0154 26.2065 28.3837 28.6229
9.6354 4.6490 10.8403 4.0889 6.4592 6.7922
57.8124 27.8940 65.1618 24.3334 775.1040 815.0440

CELL #
MEMBRANE TYPE
SAMPLE TIME (min.)
BOTTLE WEIGHT (grams)
BOTTLE+SAMPLE WEIGHT (grams)
SAMPLE WEIGHT (grams)
PERMEATE RATE (gr./hr.)
SOLUTE CONC. IN PERMEATE
SOLUTE REJECTION

1 2 3 4 5 6
CAB2 CAB1 CTA2 CTA1 PAM3 PAM1
10.0000 10.0000 10.0000 10.0000 0.5000 0.5000
21.9404 22.2040 21.9789 22.3323 22.2561 22.4723
31.6395 26.8794 32.8545 26.4288 28.6967 28.0674
9.6991 4.6754 10.8756 4.0965 6.4406 6.5951
58.1946 28.0524 65.2536 24.5790 772.8720 791.4120
35 34 34 33 34 35
-3 0 0 3 0 -3

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 68 PRODUCT RUN N-BUTYL BENZENE
 DATE- 9/17/86 CONC. (MOL/L) 36

WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 24.3 C
 INITIAL FEED CONC. (MOL/L) 35
 FINAL FEED CONC. (MOL/L) 36

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
 RUN NO.-
 DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
RENAME TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	RENAME TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	20.0000	20.0000	20.0000	20.0000	1.0000	1.0000	SAMPLE TIME (min.)						
BOTTLE HEIGHT (grams)	22.4977	22.6089	22.4238	22.1430	22.2170	22.2925	BOTTLE HEIGHT (grams)						
BOTTLE+SAMPLE HEIGHT (grams)	32.2338	27.2573	33.0406	26.0464	28.1901	28.5816	BOTTLE+SAMPLE HEIGHT (grams)						
SAMPLE HEIGHT (grams)	9.7341	4.6484	10.6168	3.9034	5.9731	6.2891	SAMPLE HEIGHT (grams)						
PENMEATE RATE (gr./hr.)	29.2023	13.9452	31.8264	11.7102	358.3860	377.3460	PENMEATE RATE (gr./hr.)						
SOLITE CONC. IN PENMEATE	34	34	34	34	36	35	SOLITE CONC. IN PENMEATE						
SOLITE REJECTION	6	6	6	6	0	3	SOLITE REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

EMR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 68
DATE- 10/1/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOL/L) 33
FINAL FEED CONC. (MMOL/L) 34

PURE SOLVENT RUN

PHASE- TOLUENE
RUN NO.- 70
DATE- 10/1/86

PRODUCT RUN 1-NONENE
CONC. (MMOL/L) 34

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	20.0000	20.0000	20.0000	20.0000	1.0000	1.0000
BOTTLE WEIGHT (grams)	22.2078	22.4051	22.1046	22.0582	22.2630	22.4398
BOTTLE+SAMPLE WEIGHT (grams)	32.4273	27.2445	32.9411	26.0716	28.9768	30.6396
SAMPLE WEIGHT (grams)	10.2245	4.8394	10.8365	4.0134	6.7138	8.1998
PERMEATE RATE (gr./hr.)	30.6735	14.5182	32.5095	12.0402	402.8280	491.9880
SOLUTE CONC. IN PERMEATE	32	32	32	30	33	10
% SOLUTE REJECTION	6	6	6	12	3	47

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 71
 DATE- 10/1/86

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25 C
 INITIAL FEED CONC. (MMOLAR) 33
 FINAL FEED CONC. (MMOLAR) 34

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

PHASE-
 RUN NO.-
 DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.5000	SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.5000
BOTTLE WEIGHT (grams)	22.1445	21.9824	22.2127	22.1438	22.5323	22.3434	BOTTLE WEIGHT (grams)	22.1445	21.9824	22.2127	22.1438	22.5323	22.3434
BOTTLE+SAMPLE WEIGHT (grams)	31.9746	26.7314	33.1823	26.3350	29.0173	29.1052	BOTTLE+SAMPLE WEIGHT (grams)	31.9746	26.7314	33.1823	26.3350	29.0173	29.1052
SAMPLE WEIGHT (grams)	9.8301	4.7490	10.9796	4.1912	6.4850	6.7618	SAMPLE WEIGHT (grams)	9.8301	4.7490	10.9796	4.1912	6.4850	6.7618
PERMEATE RATE (gr./hr.)	58.9806	28.4940	65.8776	25.1472	778.2000	811.4160	PERMEATE RATE (gr./hr.)	58.9806	28.4940	65.8776	25.1472	778.2000	811.4160
SOLUTE CONC. IN PERMEATE	33	32	33	31	33	33	SOLUTE CONC. IN PERMEATE	33	32	33	31	33	33
SOLUTE REJECTION	3	6	3	9	3	3	SOLUTE REJECTION	3	6	3	9	3	3

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.- 72
DATE- 10/11/86

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 1000 PSI
25 C

PURE SOLVENT RUN

PHASE-
RUN NO.- 73
DATE- 10/11/86

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 1000 PSI
25 C
INITIAL FEED CONC. (MMOLAR) - 35
FINAL FEED CONC. (MMOLAR) - 36

ENR - HEPTANE, TOLUENE PROJECT

PRODUCT RUN i-OCTANE
CONC. (MMOLAR) 36

CELL #	1	2	3	4	5	6
HEXAMER TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	10.0000	10.0000	10.0000	10.0000	0.5000	0.5000
BOTTLE WEIGHT (grams)	22.3605	22.4959	22.2623	21.8426	22.2229	22.2683
BOTTLE+SAMPLE WEIGHT (grams)	32.1092	27.1894	33.2342	26.0216	28.6642	29.4513
SAMPLE WEIGHT (grams)	9.7487	4.6935	10.9719	4.1790	6.4413	7.3830
PERMEATE RATE (gr./hr.)	58.4922	28.1610	65.8314	25.0740	772.9560	885.9600
SOLUTE CONC. IN PERMEATE	35	34	36	33	37	46.0000
SOLUTE REJECTION	3	6	0	8	-3	-11

EHR - HEPTANE, TOLUENE PROJECT

EHR - HEPTANE, TOLUENE PROJECT

PHASE-
 RUN NO.-
 DATE-
 TOLUENE
 74 PRODUCT RUN 1-OCTANE
 10/1/86 CONC. (MMOLAR) 36
 WORKING PRESSURE-
 SYSTEM TEMP. (AVG.)-
 INITIAL FEED CONC. (MMOLAR)
 FINAL FEED CONC. (MMOLAR)
 500 PSI
 24.5 C
 35
 36

WORKING PRESSURE-
 SYSTEM TEMP. (AVG.)-
 PURE SOLVENT RUN
 CTA1 CTA2 CTA3

PHASE-
 RUN NO.-
 DATE-
 CELL #

CELL #	MEMBRANE TYPE	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
CAR2	CAR2						
CAR1	CAR1						
PAN3	PAN3						
CTA1	CTA1						
CTA2	CTA2						
CTA3	CTA3						

SAMPLE
 TIME
 (min.)
 BOTTLE
 WEIGHT
 (grams)
 BOTTLE+SAMPLE
 WEIGHT
 (grams)
 SAMPLE
 WEIGHT
 (grams)
 PERMEATE
 RATE
 (gr./hr.)
 SOLUTE
 CONC. IN
 PERMEATE
 X
 SOLUTE
 REJECTION

21.0000 21.0000 21.0000 21.0000 21.0000 21.0000 21.0000
 22.5881 22.1721 22.3414 22.8071 22.4763 21.9903
 32.7731 27.0136 33.3954 26.9450 28.6139 28.8187
 10.1850 4.8415 11.0540 4.1379 6.1376 6.8284
 29.1000 13.8329 31.5829 11.8226 368.2540 409.7040
 36 34 35 33 37 36
 0 6 3 8 -3 0

ENR - HEPTANE, TOLUENE PROJECT

PHASE - TOLUENE
 RUN NO. - 75
 DATE - 13/1/86

WORKING PRESSURE - 500 PSI
 SYSTEM TEMP. (avg.) - 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE - TOLUENE
 RUN NO. - 76
 DATE - 13/1/86

PRODUCT RUN MIXED XYLENES
 CONC. (MMOLAR) 35

WORKING PRESSURE - 500 PSI
 SYSTEM TEMP. (avg.) - 24 C
 INITIAL FEED CONC. (MMOLAR) 33
 FINAL FEED CONC. (MMOLAR) - 36

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	21.0000	21.0000	21.0000	21.0000	1.0000	1.0000
BOTTLE WEIGHT (grams)	22.3090	22.2482	22.5246	22.3387	22.4610	22.2070
BOTTLE+SAMPLE WEIGHT (grams)	32.9191	27.2444	33.7182	26.4816	28.5271	29.9854
SAMPLE WEIGHT (grams)	10.6101	4.9962	11.1916	4.1429	6.0661	7.7784
PERMEATE RATE (gr./hr.)	30.3146	14.2749	31.9760	11.8559	363.9660	466.7040
SOLUTE CONC. IN PERMEATE	34	32	32	31	35	32
SOLUTE REJECTION	3	9	9	11	0	9

EMR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 77
 DATE- 10/1/86
 CONC. (MMOLAR) 35

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (AVG.)- 25 C
 INITIAL FEED CONC. (MMOLAR) 33
 FINAL FEED CONC. (MMOLAR) 36

EMR - HEPTANE, TOLUENE PROJECT

PURE SOLVENT RUN
 WORKING PRESSURE-
 SYSTEM TEMP. (AVG.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	11.0000	11.0000	11.0000	11.0000	0.5000	0.5000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	21.9977	22.4320	22.1606	22.1381	22.2411	22.3561	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	33.1396	27.8013	34.4862	26.7912	28.7764	29.5616	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	11.1413	5.3493	12.3256	4.6531	6.5353	7.2055	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	60.7707	29.2871	67.2305	25.3805	784.2360	864.6600	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	32	34	33	32	34	36	SOLUTE CONC. IN PERMEATE						
% SOLUTE REJECTION	9	3	6	9	3	-3	% SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
 RUN NO.- 80
 DATE- 13/1/86 CONC (MOLAR) 30

WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 24.5 C
 INITIAL FEED CONC. (F1)- 29
 FINAL FEED CONC. (F2)- 31

ENR - HEPTANE, TOLUENE PROJECT

PURE SOLVENT RUN
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

6,0000
 5,0000
 4,0000
 3,0000
 2,0000
 1,0000

PAN1

FAN3

CTA1

CTA2

CAB1

CAB2

CELL #

MEMBRANE TYPE

TIME (min.)

BOTTLE WEIGHT (grams)

BOTTLE+SAMPLE WEIGHT (grams)

SAMPLE WEIGHT (grams)

PERMEATE RATE (gr./hr.)

SOLUTE REJECTION

WPLE

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 78
DATE- 13/1/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 79
DATE- 13/1/86

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR) 31
FINAL FEED CONC. (MMOLAR)- 33

PRODUCT RUN DIBENZOTHIOPHENE
CONC. (MMOLAR) 32

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	13.0000	13.0000	13.0000	13.0000	0.5000	0.5000
BOTTLE WEIGHT (grams)	22.1361	22.0872	22.3173	22.3545	22.1064	22.0808
BOTTLE+SAMPLE WEIGHT (grams)	35.0194	28.2792	36.7125	27.8180	28.4937	29.0606
SAMPLE WEIGHT (grams)	12.8833	6.1920	14.3952	5.4635	6.3873	6.9738
PERMEATE RATE (gr./hr.)	59.4614	28.5785	66.4394	25.2162	766.4760	836.8560
SOLUTE CONC. IN PERMEATE	26	25	31	33	33	29
SOLUTE REJECTION	19	22	3	-3	-3	9

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- B1
DATE- 14/1/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 82
DATE- 14/1/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C
INITIAL FEED CONC. (MMOLAR) 35
FINAL FEED CONC. (MMOLAR) 30

PRODUCT RUN BENZOTHIOPHENE
CONC. (MMOLAR) 33

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	19.0000	19.0000	19.0000	19.0000	1.0000	1.0000
BOTTLE WEIGHT (grams)	22.3536	22.4935	22.1095	22.0366	22.2416	22.3402
BOTTLE+SAMPLE WEIGHT (grams)	31.7849	26.9390	32.0959	25.7504	28.3134	30.4441
SAMPLE WEIGHT (grams)	9.4313	4.4455	9.9864	3.7138	6.0718	8.1039
PERMEATE RATE (gr./hr.)	29.7831	14.0384	31.5360	11.7278	364.3080	486.2340
SOLUTE CONC. IN PERMEATE	32	33	34	32	34	34
SOLUTE REJECTION	3	0	-3	3	-3	-3

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
TOLUENE
RUN NO.- 03
DATE- 14/1/86

WORKING PRESSURE-
1000 PSI
25 C
PRODUCT RUN BENZOTIOPHENE
CONC.(MOLAR) 33
INITIAL FEED CONC.(F1)-
FINAL FEED CONC.(F2)-

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
TOLUENE
RUN NO.-
DATE-

PURE SOLVENT RUN
WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	11.0000	11.0000	11.0000	11.0000	0.5000	0.5000
BOTTLE WEIGHT (grams)	22.4911	22.2369	22.0229	22.2290	21.9940	22.3631
BOTTLE+SAMPLE WEIGHT (grams)	33.3896	27.4930	34.0550	26.8235	28.2723	29.1360
SAMPLE WEIGHT (grams)	10.8985	5.2561	12.0321	4.5945	6.2775	6.7729
PERMEATE RATE (gr./hr.)	59.4464	28.6696	65.6296	25.0609	753.3000	812.7400
SOLUTE CONC. IN PERMEATE	34	34	34	35	37	37
SOLUTE REJECTION	-3	-3	-3	-6	-12	-12

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 84
DATE- 14/1/86

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 85
DATE- 14/1/86

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 26 C
INITIAL FEED CONC. (MMOL/L) 57
FINAL FEED CONC. (MMOL/L) 57

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CIA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	11.0000	11.0000	11.0000	11.0000	0.5000	0.5000
BOTTLE WEIGHT (grams)	22.3345	22.3046	22.3280	22.3018	22.0825	22.4360
BOTTLE+SAMPLE WEIGHT (grams)	32.5895	27.1448	33.8233	26.5841	28.2548	28.7775
SAMPLE WEIGHT (grams)	10.2550	4.8402	11.4953	4.2823	6.1743	6.3415
PERMEATE RATE (gr./hr.)	55.8273	26.4011	62.7016	23.3580	740.9160	760.9800
SOLUTE CONC. IN PERMEATE	67	68	58	63	55	56
SOLUTE REJECTION	-18	-19	-2	-11	4	2

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

TOLUENE
R6
14/1/86

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
57 INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

PHASE-
RUN NO.-
DATE-

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	21.0000	21.0000	21.0000	21.0000	1.0000	1.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.1068	22.4431	22.4878	22.4915	21.8028	22.6739	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	31.9980	27.0048	33.1126	26.3331	27.6773	28.6719	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	9.8912	4.5617	10.6248	3.8416	5.8745	5.9980	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	28.0034	13.0334	30.3546	10.9760	332.4700	359.8800	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	57	59	59	62	56	56	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0	-4	-4	-9	2	2	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 87
DATE- 15/1/86

WORKING PRESSURE
SYSTEM TEMP. (avg.)- 500 PSI
24 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 88
DATE- 15/1/86

PRODUCT RUN D-CRESOL
CONC. (MMOLAR) 67

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C
INITIAL FEED CONC. (MMOLAR) 68
FINAL FEED CONC. (MMOLAR)- 66

CELL #	HEPTANE TYPE	1	2	3	4	5	6
		CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	24.0000	24.0000	24.0000	24.0000	24.0000	1.0000	1.0000
BOTTLE WEIGHT (gr aas)	22.2012	22.4369	22.7725	22.0735	22.6719	22.3428	
BOTTLE+SAMPLE WEIGHT (gr aas)	33.6086	27.8067	34.8206	26.5414	20.3856	29.5961	
SAMPLE WEIGHT (gr aas)	11.4074	5.3698	12.0481	4.4679	5.7137	7.2533	
PERMEATE RATE (gr./hr.)	20.5185	13.4245	30.1203	11.1698	342.8220	435.1980	

CELL #	HEPTANE TYPE	1	2	3	4	5	6
		CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	21.0000	21.0000	21.0000	21.0000	21.0000	1.0000	1.0000
BOTTLE WEIGHT (gr aas)	22.3897	22.2808	22.1383	21.8354	22.2753	21.9143	
BOTTLE+SAMPLE WEIGHT (gr aas)	32.1743	26.8421	32.4944	25.6011	28.0284	29.3261	
SAMPLE WEIGHT (gr aas)	9.7846	4.5613	10.3561	3.7657	5.7531	7.4118	
PERMEATE RATE (gr./hr.)	27.9560	13.0323	29.5889	10.7591	345.1860	444.7080	
SOLUTE CONC. IN PERMEATE	65	68	69	71	64	69	
SOLUTE REJECTION	3	-1	-3	-6	4	-3	

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO. -
DATE -

TOLUENE
89
15/1/86

PRODUCT RUN
CONC (MOLAR)

0-CRESOL

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -
67 INITIAL FEED CONC. (F1) -
FINAL FEED CONC. (F2) -

1000 PSI
25 C

68
66

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO. -
DATE -

PURE SOLVENT RUN

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -

CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000	CELL #
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE
SAMPLE TIME (min.)	11,0000	11,0000	11,0000	11,0000	0,5000	0,5000	SAMPLE TIME (min.)
BOTTLE WEIGHT (grams)	22,5182	22,0112	22,3027	22,1992	21,9566	22,2604	BOTTLE WEIGHT (grams)
BOTTLE+SAMPLE WEIGHT (grams)	32,6515	26,8110	33,5420	26,3810	27,8140	28,7030	BOTTLE+SAMPLE WEIGHT (grams)
SAMPLE WEIGHT (grams)	10,1335	4,7998	11,2393	4,1828	5,8574	6,4426	SAMPLE WEIGHT (grams)
PERMEATE RATE (gr./hr.)	55,2725	26,1807	61,3083	22,8153	702,8880	773,1120	PERMEATE RATE (gr./hr.)
SOLUTE CONC. IN PERMEATE	70	70	68	77	67	66	SOLUTE CONC. IN PERMEATE
SOLUTE REJECTION	-4	-4	-1	-15	0	1	SOLUTE REJECTION

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 90
DATE- 15/1/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

PHASE- TOLUENE
RUN NO.- 91
DATE- 15/1/86

PRODUCT RUN P-CRESOL
CONC. (MMOLAR) 39

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (MMOLAR) 38
FINAL FEED CONC. (MMOLAR)- 39

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	11.0000	11.0000	11.0000	11.0000	0.5000	0.5000
BOTTLE WEIGHT (gr aas)	22.0572	22.2302	21.9103	22.2593	22.4400	22.1985
BOTTLE+SAMPLE WEIGHT (gr aas)	32.3513	27.2346	33.6416	26.7414	28.4916	28.8068
SAMPLE WEIGHT (gr aas)	10.2941	5.0044	11.7313	4.4821	6.0516	6.6083
PERMEATE RATE (gr./hr.)	56.1496	27.2967	63.9809	24.4478	726.1920	792.9960

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	11.0000	11.0000	11.0000	11.0000	0.5000	0.5000
BOTTLE WEIGHT (gr aas)	22.1391	22.1786	22.4145	22.1545	22.1487	22.1714
BOTTLE+SAMPLE WEIGHT (gr aas)	32.0221	26.8406	33.5899	26.3256	28.1028	28.8476
SAMPLE WEIGHT (gr aas)	9.8840	4.6620	11.1754	4.1711	6.0341	6.6712
PERMEATE RATE (gr./hr.)	53.9127	25.4291	60.9567	22.7515	724.0920	800.5440
SOLUTE CONC. IN PERMEATE	40	38	39	44	39	38
% SOLUTE REJECTION	-3	3	0	-13	0	3

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PRODUCT RUN P-CRESOL
CONC (MOLAR)
500 PSI
24 C
38
39

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN
WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	23.0000	23.0000	23.0000	23.0000	1.0000	1.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.2184	22.1291	22.7023	22.4218	22.3496	22.1607	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	32.3896	26.0667	33.2710	26.4339	27.9393	28.3162	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	10.1712	4.7376	11.0687	4.0121	5.5697	6.1555	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	26.3536	12.3390	28.8749	10.4663	334.1870	369.3300	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	39	40	41	43	38	38	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0	-3	-5	-10	3	3	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE - TOLUENE
RUN NO. - 93
DATE - 16/1/86

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 24.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE - TOLUENE
RUN NO. - 94
DATE - 16/1/86

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 24.5 C
INITIAL FEED CONC. (MMOL/L) - 31
FINAL FEED CONC. (MMOL/L) - 32

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	22.0000	22.0000	22.0000	22.0000	1.0000	1.0000
BOTTLE WEIGHT (grams)	22.7668	22.4139	22.1144	21.9518	22.3031	22.2786
BOTTLE+SAMPLE WEIGHT (grams)	32.8010	27.3839	33.3626	26.1615	28.0714	29.4239
SAMPLE WEIGHT (grams)	10.5350	4.9700	11.2482	4.2097	5.7683	7.1453
PERMEATE RATE (gr./hr.)	20.7310	13.5545	30.6769	11.4810	346.0980	420.7100
SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION						

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	22.0000	22.0000	22.0000	22.0000	1.0000	1.0000
BOTTLE WEIGHT (grams)	22.0090	22.1146	22.3336	22.4394	22.4633	22.3103
BOTTLE+SAMPLE WEIGHT (grams)	32.5112	27.0691	33.6225	26.6385	28.2697	29.4945
SAMPLE WEIGHT (grams)	10.5022	4.9543	11.2889	4.1991	5.8064	7.1842
PERMEATE RATE (gr./hr.)	20.4424	13.5117	30.7879	11.4521	348.3840	431.0520
SOLUTE CONC. IN PERMEATE	30	29	30	27	30	32
SOLUTE REJECTION	6	9	6	16	6	0

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-
16/1/86

PRODUCT RUN TRICENTYLAMINE
CONC.(MOLAR)
32 INITIAL FEED CONC.(F1)-
FINAL FEED CONC.(F2)-

1000 PSI
25 C
31
32

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
PURE SOLVENT RUN

PHASE-
RUN NO.-
DATE-

CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000	CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	12,0000	12,0000	12,0000	12,0000	0,5000	0,5000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (gr aas)	21,7743	22,7447	22,2616	22,3307	22,1114	22,1545	BOTTLE WEIGHT (gr aas)						
BOTTLE+SAMPLE WEIGHT (gr aas)	33,3129	28,2853	35,1678	27,2657	28,2105	28,6648	BOTTLE+SAMPLE WEIGHT (gr aas)						
SAMPLE WEIGHT (gr aas)	11,5386	5,5406	12,9062	4,9350	6,0991	6,5103	SAMPLE WEIGHT (gr aas)						
PERMEATE RATE (gr./hr.)	57,6930	27,7030	64,5310	24,6750	731,8920	781,2360	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	30	30	31	13	31	32	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	6	6	3	59	3	8	SOLUTE REJECTION						

APPENDIX D
CYCLOHEXANE TEST DATA

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 1
DATE- 3/3/86

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25
INITIAL FEED CONC. (MMOL/L)-
FINAL FEED CONC. (MMOL/L)-

PHASE- CYCLOHEXANE
RUN NO.- 2
DATE- 3/3/86

PRODUCT RUN P-ETHYLENE
CONC. (MMOL/L) 40

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	5.0000	5.0000	6.0000	46.0000		
BOTTLE WEIGHT (grams)	22.2207	22.3069	22.4424	22.1230	22.0476	22.0580
BOTTLE+SAMPLE WEIGHT (grams)	27.6675	26.4409	26.1539	0.0000	26.2928	0.0000
SAMPLE WEIGHT (grams)	5.4388	4.0440	3.7115	4.2452	-22.0580	
PERMEATE RATE (gr./hr.)	65.2656	48.5280	37.1150	5.5372	ERR	

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	5.0000	6.0000	32.0000		
BOTTLE WEIGHT (grams)	22.2895	22.4346	22.4368	22.6517		
BOTTLE+SAMPLE WEIGHT (grams)	27.0594	26.7178	26.4298	26.5772		
SAMPLE WEIGHT (grams)	4.7699	4.2832	3.9930	3.9255		
PERMEATE RATE (gr./hr.)	71.5465	51.3984	39.9300	7.3403		
SOLUTE CONC. IN PERMEATE	40	39	40	41		
SOLUTE REJECTION	0	3	0	-3		

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE

RUN NO.- 3

DATE- 3/3/86

1000 PSI

25 C

1000 PSI

25 C

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

INITIAL FEED CONC. (F1)-

FINAL FEED CONC. (F2)-

PHASE-
RUN NO.-

DATE-

ENR - HEPTANE, TOLUENE PROJECT

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

INITIAL FEED CONC. (F1)-

FINAL FEED CONC. (F2)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	2.0000	2.0000	3.0000	24.0000			SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.6001	22.2710	22.7023	22.3870			BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	28.2561	26.6308	28.0233	26.1886			BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	5.6560	4.3598	5.1210	3.8016			SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	169.6800	130.7940	102.4200	9.5940			PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	39	40	39	49			SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	3	0	3	-23			SOLUTE REJECTION						

EHR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 4
DATE- 4/3/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.) - 25.5 C

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 5
DATE- 4/3/86

WORKING PRESSURE- 1000
SYSTEM TEMP. (avg.) -
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR) -

PRODUCT RUN ETHYLBENZENE
CONC. (MMOLAR) 40

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAM1	PAM1
SAMPLE TIME (min.)	2,000	2,000	3,000			
BOTTLE WEIGHT (grams)	21.8872	21.9039	22.4760			
BOTTLE+SAMPLE WEIGHT (grams)	28.0010	26.0621	27.2761			
SAMPLE WEIGHT (grams)	6.1138	4.2583	4.8001			
PERMEATE RATE (gr./hr.)	103.4140	127.7490	96.0020			
SOLUTE CONC. IN PERMEATE	41	41	41			
SOLUTE REJECTION	-3	-3	-3			

EMD - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO. - 6
 DATE- 4/3/86

WORKING PRESSURE-
 SYSTEM TEMP. (avg.) -
 INITIAL FEED CONC. (F1) -
 FINAL FEED CONC. (F2) -

PHASE-
 RUN NO. -
 DATE -

EMD - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
 SYSTEM TEMP. (avg.) -

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CM2	CAR1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CM2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	5.0000	5.0000				SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.0010	22.3436	21.9958				BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	26.6527	26.4356	25.1038				BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	4.6517	4.0920	3.1080				SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	69.7785	49.1040	37.2960				PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	41	41	41				SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0	0	0				SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 7
DATE- 4/3/86

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 24.25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.-
DATE- 4/3/86

WORKING PRESSURE- 500
SYSTEM TEMP. (avg.)- 25.
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

PRODUCT RUN
CUMENE
CUMC. (MMOLAR) 3.0

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	5.0000	5.0000	6.0000		3.0000	3.0000
BOTTLE WEIGHT (gr ams)	22.5137	22.4095	22.3819		22.4920	22.2932
BOTTLE+SAMPLE WEIGHT (gr ams)	28.4258	28.5039	26.1357		27.6762	25.6842
SAMPLE WEIGHT (gr ams)	5.9121	4.0944	3.7538		5.1842	3.3910
PERMEATE RATE (gr./hr.)	70.9452	49.1328	37.5380		103.6840	67.8200
SOLUTE CONC. IN PERMEATE	38	37	39		30	31
SOLUTE REJECTION	0	3	-3		0	-3

EMP - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 9
DATE- 4/3/86

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	
SAMPLE TIME (min.)	2.0000	2.0000	3.0000	2.0000	2.0000	2.0000	
BOTTLE WEIGHT (grams)	22.0192	22.5256	22.0238	22.0192	22.2749	22.0911	
BOTTLE+SAMPLE WEIGHT (grams)	28.4763	26.9123	26.9769	26.4667	26.0976	26.6667	
SAMPLE WEIGHT (grams)	6.4571	4.3867	4.9531	4.5756	6.8227	4.5756	
PERMEATE RATE (gr./hr.)	193.7130	131.6010	99.1020	204.6810	137.2680		
SOLUTE CONC. IN PERMEATE	38	38	37	30	32		
SOLUTE REJECTION	0	0	3	-15	-23		



ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 10
DATE- 5/3/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 24.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 11
DATE- 5/3/86

WORKING PRESSURE- 1000
SYSTEM TEMP. (avg.)- 25
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

PRODUCT RUN
CONC. (MMOLAR) 16

CELL #	1	2	3	4	5	6
PERMEATE TYPE	CAR2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	2.0000	2.0000	3.0000			
BOTTLE WEIGHT (grams)	22.1741	22.3370	22.3191			
BOTTLE+SAMPLE WEIGHT (grams)	28.3582	28.6642	27.2362			
SAMPLE WEIGHT (grams)	6.1841	4.3264	4.9171			
PERMEATE RATE (gr./hr.)	185.5230	129.7920	98.3420			
SOLUTE CONC. IN PERMEATE	16	16	16			
% SOLUTE REJECTION	0	0	0			

EMR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 12
DATE- 5/3/86

PRODUCT RUN TOLUENE
CONC.(MOL/L) 16

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.5 C
INITIAL FEED CONC. (F1)- 16
FINAL FEED CONC. (F2)- 16

EMR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

PHASE-
RUN NO.-
DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	5.0000	6.0000				SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.4239	22.0279	21.8560				BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	27.0396	26.0434	25.5861				BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	4.6157	4.0355	3.7301				SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	69.2355	48.4240	37.3010				PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	16	15	14				SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0	6	0				SOLUTE REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 14
DATE- 5/3/86

WORKING PRESSURE- 500 P
SYSTEM TEMP. (AVG.)- 24
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	5.0000	6.0000			
BOTTLE WEIGHT (grams)	22.7267	22.0182	22.6033			
BOTTLE+SAMPLE WEIGHT (grams)	27.4400	26.0944	26.3830			
SAMPLE WEIGHT (grams)	4.7133	4.0762	3.7797			
PERMEATE RATE (gr./hr.)	70.6995	48.9144	37.7970			

EMR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 14
DATE- 5/3/86

WORKING PRESSURE- 500 P
SYSTEM TEMP. (AVG.)- 24
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	5.0000	6.0000			
BOTTLE WEIGHT (grams)	22.3419	22.5415	22.5176			
BOTTLE+SAMPLE WEIGHT (grams)	26.9873	26.5799	26.2879			
SAMPLE WEIGHT (grams)	4.6454	4.0384	3.7703			
PERMEATE RATE (gr./hr.)	69.6810	48.4608	37.7030			
SOLUTE CONC. IN PERMEATE	32	29	33			
SOLUTE REJECTION	-3	6	-6			

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 16
DATE- 6/3/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.) - 25.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 17
DATE- 6/3/86

PRODUCT RUN n-BUTYLBENZENE
CONC. (MMOLAR) 31

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.) - 24.25
INITIAL FEED CONC. (MMOLAR) 3
FINAL FEED CONC. (MMOLAR) - 3

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMORANDUM TYPE	CAB2	CAB1	CTA2	CTA1	PMAS	PMAL
SAMPLE TIME (min.)	2.0000	2.0000	3.0000			
BOTTLE WEIGHT (grams)	22.4120	22.4359	22.5363			
BOTTLE+SAMPLE WEIGHT (grams)	28.0640	26.4400	27.2156			
SAMPLE WEIGHT (grams)	5.6520	4.0241	4.6793			
PERMEATE RATE (gr./hr.)	169.5600	120.7230	93.5860			

CELL #	1	2	3	4	5	6
MEMORANDUM TYPE	CAB2	CAB1	CTA2	CTA1	PMAS	PMAL
SAMPLE TIME (min.)	2.0000	3.0000	3.0000			
BOTTLE WEIGHT (grams)	22.4680	22.4375	22.4623			
BOTTLE+SAMPLE WEIGHT (grams)	28.4633	28.7555	27.3016			
SAMPLE WEIGHT (grams)	5.9953	6.3180	4.8393			
PERMEATE RATE (gr./hr.)	179.8590	126.3600	96.7860			
SOLUTE CONC. IN PERMEATE	32	31	28			
SOLUTE REJECTION	-3	0	10			

EMP - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 10
 DATE- 6/3/86

PRODUCT RUN n-HEPTANE
 CONC. (Wt. %)- 30

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-
 INITIAL FEED CONC. (P1)-
 FINAL FEED CONC. (P2)-

500 PSI
 24.25 C
 2P
 31

EMP - HEPTANE, TOLUENE PROJECT

PLANE SOLVENT RUN

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000	CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000
MEMBRANE TYPE							MEMBRANE TYPE						
SAMPLE TIME (min.)		5,0000	5,0000	5,0000	5,0000	5,0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22,4808	22,8587	22,8190				BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	28,0192	26,7727	25,8517				BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	5,5384	3,9140	3,0327				SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	66,4608	46,9680	36,3924				PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	31	31	33				SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-3	-3	-10				SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 24.5 C

PHASE - CYCLOHEXANE
RUN NO. - 19
DATE - 6/3/86

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 500 F
SYSTEM TEMP. (avg.) - 25
INITIAL FEED CONC. (MMOLAR) -
FINAL FEED CONC. (MMOLAR) -

PHASE - CYCLOHEXANE
RUN NO. - 20
DATE - 6/3/86

PRODUCT RUN n-PROPYL BENZENE
CONC. (MMOLAR) - 43

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	5.0000	5.0000	5.0000	5.0000	6.0000
BOTTLE WEIGHT (grams)	22.4926	22.5101	22.4084			
BOTTLE+SAMPLE WEIGHT (grams)	27.0119	26.4730	25.4807			
SAMPLE WEIGHT (grams)	4.5193	3.9629	3.0723			
PERMEATE RATE (gr./hr.)	67.7895	47.5340	36.8676			

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	5.0000	5.0000	6.0000			
BOTTLE WEIGHT (grams)	22.1100	21.9775	22.5605			
BOTTLE+SAMPLE WEIGHT (grams)	27.8019	25.9555	26.2937			
SAMPLE WEIGHT (grams)	5.6839	3.9780	3.7332			
PERMEATE RATE (gr./hr.)	68.7068	47.7360	37.3320			
SOLUTE CONC. IN PERMEATE	37	46	42			
SOLUTE REJECTION	14	7	2			

EPR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 21
DATE- 6/3/66

PRODUCT RUN n-PROPYL BENZENE
CONC (MOLAR) 40

1000 PSI
25.5 C

EPR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CA02	CA01	CT02	CT01	PA03	PA01	MEMBRANE TYPE	CA02	CA01	CT02	CT01	PA03	PA01
SAMPLE TIME (min.)	2.0000	2.0000	3.0000				SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.6468	22.4952	22.0851				BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	28.7007	26.7276	26.9603				BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	6.0539	4.2324	4.8752				SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	181.6170	126.8720	97.5040				PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	41	41	38				SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-3	-3	5				SOLUTE REJECTION						

EMP - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 22
 DATE- 13/3/86

WORKING PRESSURE 1000 PSI
 SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

EMP - HEPTANE TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 23
 DATE- 13/3/86

PRODUCT RUN n-PENTANE
 CONC. (MMOL/L) 26

WORKING PRESSURE- 1000
 SYSTEM TEMP. (avg.)- 24.
 INITIAL FEED CONC. (MMOL/L)
 FINAL FEED CONC. (MMOL/L)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	3.0000	3.0000			
BOTTLE WEIGHT (grams)	22.2741	22.3765	22.8405			
BOTTLE+SAMPLE WEIGHT (grams)	30.9463	29.3905	29.1311			
SAMPLE WEIGHT (grams)	8.6722	7.0140	6.2906			
PERMEATE RATE (gr./hr.)	173.4440	140.2800	125.8120			

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000	2.0000	2.0000			
BOTTLE WEIGHT (grams)	22.5957	21.9070	22.9463			
BOTTLE+SAMPLE WEIGHT (grams)	28.9334	26.7351	27.1344			
SAMPLE WEIGHT (grams)	6.3377	4.8273	4.1481			
PERMEATE RATE (gr./hr.)	190.1310	144.8190	125.0430			
SOLUTE CONC. IN PERMEATE	25	22	22			
SOLUTE REJECTION	4	15	15			

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 25
 DATE- 19/3/86

WORKING PRESSURE 500 PSI
 SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 26
 DATE- 19/3/86

WORKING PRESSURE- 500 FS
 SYSTEM TEMP. (avg.)- 25
 INITIAL FEED CONC. (MMOL/L)- 6
 FINAL FEED CONC. (MMOL/L)- 6

PRODUCT RUN n-HEPTANE
 CONC. (MMOL/L) 63

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	3.0000	4.0000		5.0000	10.0000
BOTTLE WEIGHT (grams)	22.5584	22.8411	22.4395		22.5471	22.1164
BOTTLE+SAMPLE WEIGHT (grams)	27.6280	26.3063	26.6437		26.7997	25.5313
SAMPLE WEIGHT (grams)	5.0706	3.4652	4.2044		4.2526	3.4149
PERMEATE RATE (gr./hr.)	101.4120	69.3040	63.0660		51.0312	20.4894
SOLUTE CONC. IN PERMEATE	59	61	59		61	60
% SOLUTE REJECTION	6	3	6		3	3

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PRODUCT RUN
CONC. (MOLE/L)

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

1000 PSI
25.5 C

62
62

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	2.0000	2.0000	3.0000		3.0000	6.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.5291	22.0218	22.6939		22.5015	22.4074	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	28.6131	25.9159	28.9887		27.2365	25.6709	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	6.0840	3.8941	6.2948		4.7350	3.2635	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	182.5200	116.8230	125.8960		94.7000	32.6350	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	64	63	60		61	62	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-3	-2	3		2	0	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 28
DATE- 19/3/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 29
DATE- 19/3/86

PRODUCT RUN 2,2-DIMETHYL BUTANE
CONC. (MMOLAR) 16

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 24.5
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000	2.0000	3.0000	3.0000	3.0000	7.0000
BOTTLE HEIGHT (grams)	21.9307	22.0982	22.5260	22.7659	22.1852	
BOTTLE+SAMPLE WEIGHT (grams)	28.7883	26.4660	28.4492	26.7786	25.8946	
SAMPLE WEIGHT (grams)	6.8576	4.3678	6.1232	4.0127	3.5094	
PERMEATE RATE (gr./hr.)	205.7280	131.0340	122.4640	80.2540	30.0606	
SOLUTE CONC. IN PERMEATE	18	17	16	15	15	
SOLUTE REJECTION	-13	-6	0	6	6	

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-
CYCLOHEXANE
30
19/3/66

PRODUCT RUN 2,2-DIMETHYL BUTANE
CONC.(MOLE%) 10

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-
500 PSI
24.5 C
17
10

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN
WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
RENAME TYPE	CAR2	CAR1	CTA2	CTA1	PM3	PM1	RENAME TYPE	CAR2	CAR1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	3.0000	4.0000	4.0000	4.0000	6.0000	12.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.6325	22.4712	21.8592		22.3304	21.9528	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	26.7450	26.4485	25.8334		26.1846	24.9821	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	4.7125	4.1973	3.9832		3.8562	3.0293	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	94.2500	62.9595	59.7480		38.5620	15.1465	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	17	10	17		17	17	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	6	0	6		6	6	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 34
DATE- 20/3/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 26 C

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000	2.0000	2.0000	3.0000	5.0000	5.0000
BOTTLE WEIGHT (grams)	21.8697	21.6330	22.7257	22.0700	22.8861	22.5122
BOTTLE+SAMPLE WEIGHT (grams)	28.8539	26.3014	26.8186	27.0351	26.7862	25.9510
SAMPLE WEIGHT (grams)	6.9842	4.6684	4.0929	4.9651	3.9001	3.4388
PERMEATE RATE (gr./hr.)	209.5260	139.4520	122.7870	99.3070	46.8012	41.2656
SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 35
DATE- 20/3/86

WORKING PRESSURE- 1000
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (MMOL/L)-
FINAL FEED CONC. (MMOL/L)-

PRODUCT RUN HEXADECANE
CONC. (MMOL/L) 30

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000	2.0000	3.0000	3.0000	5.0000	5.0000
BOTTLE WEIGHT (grams)	22.6937	22.7117	22.3553	22.4563	22.5122	22.5122
BOTTLE+SAMPLE WEIGHT (grams)	29.4035	27.0396	28.3327	27.1277	25.9510	25.9510
SAMPLE WEIGHT (grams)	6.7098	4.3279	5.9774	4.6714	3.4388	3.4388
PERMEATE RATE (gr./hr.)	201.2940	129.8370	119.5480	93.4280	41.2656	41.2656
SOLUTE CONC. IN PERMEATE	37	41	34	25	23	23
SOLUTE REJECTION	3	-8	11	34	39	39

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.- 34
DATE- 20/3/86

PRODUCT RUN
CONC (WOLAN) 30

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 25 C
INITIAL FEED CONC. (F1)- 40
FINAL FEED CONC. (F2)- 36

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
REMARKS	CAR2	CAR1	CTA2	CTA1	PMS3	PMS1	REMARKS	CAR2	CAR1	CTA2	CTA1	PMS3	PMS1
TYPE							TYPE						
SAMPLE							SAMPLE						
TIME							TIME						
(min.)							(min.)						
BOTTLE							BOTTLE						
WEIGHT							WEIGHT						
(grams)							(grams)						
BOTTLE+SAMPLE							BOTTLE+SAMPLE						
WEIGHT							WEIGHT						
(grams)							(grams)						
SAMPLE							SAMPLE						
WEIGHT							WEIGHT						
(grams)							(grams)						
PENMEATE							PENMEATE						
RATE							RATE						
(gr./hr.)							(gr./hr.)						
SOLUTE							SOLUTE						
CONC. IN							CONC. IN						
PENMEATE							PENMEATE						
X							X						
SOLUTE							SOLUTE						
REJECTION							REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 37
DATE- 21/3/86

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 38
DATE- 21/3/86

WORKING PRESSURE -
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (MMOL/L)-
FINAL FEED CONC. (MMOL/L)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAN2	CAN1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	3.0000	4.0000	4.0000	4.0000	4.0000	4.0000
BOTTLE WEIGHT (grams)	22.2276	21.9937	22.4664	22.2617	22.2054	
BOTTLE+SAMPLE WEIGHT (grams)	27.3722	26.6271	26.7303	26.3763	25.5378	
SAMPLE WEIGHT (grams)	5.1446	4.6334	4.2639	4.1146	3.2524	
PERMEATE RATE (gr./hr.)	102.8920	69.5010	63.9585	61.7190	32.5240	
SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION						

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAN2	CAN1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	3.0000	4.0000	4.0000	4.0000	4.0000	4.0000
BOTTLE WEIGHT (grams)	22.4407	22.4390	22.3942	22.3937	22.3616	
BOTTLE+SAMPLE WEIGHT (grams)	27.6094	27.0824	26.5898	26.5422	25.5144	
SAMPLE WEIGHT (grams)	5.1687	4.6434	4.1956	4.1485	3.1528	
PERMEATE RATE (gr./hr.)	103.3740	69.6510	62.9740	62.2275	31.5280	
SOLUTE CONC. IN PERMEATE	36	19	25	26	40	
SOLUTE REJECTION	-50	21	-4	-8	-67	

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 39
 DATE- 21/3/86

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)- 1000 PSI
 25.5 C

ENR - HEPTANE, TOLUENE PROJECT

PURE SOLVENT RUN

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CY2	CY1	PAM3	PAM1	MEMBRANE TYPE	CAB2	CAB1	CY2	CY1	PAM3	PAM1
SAMPLE TIME (sec.)	2.0000	2.0000	3.0000		3.0000	4.0000	SAMPLE TIME (sec.)						
BOTTLE WEIGHT (grams)	22.4042	22.7046	22.4683		22.6599	22.3571	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	29.4551	27.5032	28.8108		28.4873	25.9772	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	7.0509	4.8066	6.3425		5.8274	3.6201	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	211.5270	137.8980	176.8560		116.5480	54.3015	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	19	22	9		46	26	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	46	37	74		-31	76	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 1000 PSI
SYSTEM TEMP. (avg.) - 25.5 C

PHASE - CYCLOHEXANE
RUN NO. - 40
DATE - 21/3/86

ENR - HEPTANE, TOLUENE PROJECT

PHASE - CYCLOHEXANE
RUN NO. - 41
DATE - 21/3/86

WORKING PRESSURE - 10
SYSTEM TEMP. (avg.) -
INITIAL FEED CONC. (MMOL/L) -
FINAL FEED CONC. (MMOL/L) -

PRODUCT RUN 1 - NONE
CONC. (MMOL/L) 30

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	2.0000	2.0000	2.0000		3.0000	4.0000
BOTTLE WEIGHT (gr aas)	22.8198	22.3997	22.2168	22.9443	22.4024	
BOTTLE+SAMPLE WEIGHT (gr aas)	29.9540	27.0112	26.3363	28.6033	25.8157	
SAMPLE WEIGHT (gr aas)	7.1342	4.6115	4.1195	5.6590	3.4133	
PERMEATE RATE (gr./hr.)	214.0260	138.7450	123.5850	113.1800	51.1995	
SOLUTE CONC. IN PERMEATE	30	29	30	30	30	30
SOLUTE REJECTION	0	3	0	0	0	0

EHR - HEPTANE, TOLUENE PROJECT
 EHR - HEPTANE, TOLUENE PROJECT
 PHASE - CYCLOCHEM 42
 RUN NO. -
 DATE - 21/3/86
 WORKING PRESSURE - 500 PSI
 SYSTEM TEMP. (avg.) - 25 C
 INITIAL FEED CONC. (F1) - 30
 FINAL FEED CONC. (F2) - 31
 PURE SOLVENT RUN
 WORKING PRESSURE -
 SYSTEM TEMP. (avg.) -
 PHASE -
 RUN NO. -
 DATE -

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
HEPTANE TYPE	CAR2	CAR1	CTA2	CTA1	PMK3	PMK1	HEPTANE TYPE	CAR2	CAR1	CTA2	CTA1	PMK3	PMK1
SAMPLE TIME (min.)	3.0000	4.0000	4.0000	4.0000	4.0000	8.0000	SAMPLE TIME (min.)	3.0000	4.0000	4.0000	4.0000	4.0000	8.0000
BOTTLE WEIGHT (grams)	22.4726	22.2920	23.0537		22.2694	22.4941	BOTTLE WEIGHT (grams)	22.4726	22.2920	23.0537		22.2694	22.4941
BOTTLE+SAMPLE WEIGHT (grams)	27.3948	26.6782	27.1108		25.8746	25.7448	BOTTLE+SAMPLE WEIGHT (grams)	27.3948	26.6782	27.1108		25.8746	25.7448
SAMPLE WEIGHT (grams)	4.9222	4.3862	4.0571		3.6052	3.2507	SAMPLE WEIGHT (grams)	4.9222	4.3862	4.0571		3.6052	3.2507
PENMEATE RATE (gr./hr.)	98.4440	65.7930	60.8565		54.0780	24.3803	PENMEATE RATE (gr./hr.)	98.4440	65.7930	60.8565		54.0780	24.3803
SOLUTE CONC. IN PENMEATE	31	29	33		31	30	SOLUTE CONC. IN PENMEATE	31	29	33		31	30
SOLUTE REJECTION	0	6	-6		0	3	SOLUTE REJECTION	0	6	-6		0	3

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 43
DATE- 24/3/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 44
DATE- 24/3/86

WORKING PRESSURE- 500
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (MMOL/L)-
FINAL FEED CONC. (MMOL/L)-

PRODUCT RUN METHYL CYCLOHEXANE
CONC. (MMOL/L) 34

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CM2	CAB1	CM2	CTA1	PM3	PM1
SAMPLE TIME (min.)	3.0000	4.0000	4.0000		4.0000	7.0000
BOTTLE WEIGHT (gr ams)	21.6983	22.8334	22.8720		22.5812	22.4854
BOTTLE+SAMPLE WEIGHT (gr ams)	26.7070	27.2747	26.8980		26.1900	25.5477
SAMPLE WEIGHT (gr ams)	5.0087	4.4413	4.0260		3.6088	3.0623
PERMEATE RATE (gr./hr.)	100.1740	66.6195	60.3900		54.1320	28.2483
SOLUTE CONC. IN PERMEATE	34	35	34		34	32
% SOLUTE REJECTION	0	-3	0		0	6

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 45
 DATE- 24/3/86
 PRODUCT RUN METHYL CYCLOHEXANE
 (CONC/MOL/LAR) 35
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-
 INITIAL FEED CONC. (F1)-
 FINAL FEED CONC. (F2)-
 1000 PSI
 25 C
 35
 35

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-
 PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	2.0000	3.0000	3.0000		3.0000	4.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.3965	22.1210	22.2414		22.1709	22.3933	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	29.2874	28.6676	28.2716		27.4331	25.6995	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	6.8909	6.5466	6.0302		5.2622	3.3062	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	206.7270	130.9720	120.6040		105.2440	49.5930	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	35	35	35		34	35	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0	0	0		3	0	SOLUTE REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE
SYSTEM TEMP. (avg.) -
1000 PSI
24.5 C

1000 PSI
24.5 C

PHASE - CYCLOHEPTANE
RUN NO. - 46
DATE - 24/3/86

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE
SYSTEM TEMP. (avg.) -
1000 PSI
24.5 C

1000 PSI
24.5 C

PHASE - CYCLOHEPTANE
RUN NO. - 47
DATE - 24/3/86

PRODUCT RUN CYCLOHEPTANE
CONC. (MMOLAR) 31

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR) -

1000 PSI
24.5 C

CELL #	1	2	3	4	5	6
HEPTANE TYPE	CAR2	CAB1	CTA2	CTA1	PMH3	PMH1
SAMPLE TIME (min.)	2,000	2,000	3,000	3,000	3,000	5,000
BOTTLE WEIGHT (grams)	22,3502	22,6384	22,5927	22,7873	22,3482	
BOTTLE+SAMPLE WEIGHT (grams)	29,1587	27,0246	28,6373	27,8158	25,9174	
SAMPLE WEIGHT (grams)	6,8085	4,3862	6,0446	5,0285	3,5482	
PERMEATE RATE (gr./hr.)	204,2550	131,5860	121,2920	100,5700	42,5784	
SOLUTE CONC. IN PERMEATE	50	32	32	31	30	
SOLUTE REJECTION	-61	-5	-3	0	3	

TYPE

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLONE TIME 40
 RUN NO.- 40
 DATE- 24/3/66

PRODUCT RUN CYCLONE TIME 31
 CONC (MOLE/L)

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

PHASE-
 RUN NO.-
 DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
RENAME TYPE	CAB2	CAB1	CTA2	CTA1	PMA3	PMA1	RENAME TYPE	CAB2	CAB1	CTA2	CTA1	PMA3	PMA1
SAMPLE TIME (min.)	3.0000	4.0000	4.0000		5.0000	8.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (gr aas)	22.8306	21.5684	22.7425		21.9773	22.0417	BOTTLE WEIGHT (gr aas)						
BOTTLE+SAMPLE WEIGHT (gr aas)	27.5711	25.8027	26.7174		26.1689	25.0253	BOTTLE+SAMPLE WEIGHT (gr aas)						
SAMPLE WEIGHT (gr aas)	4.7405	4.2343	3.9749		4.1916	2.9836	SAMPLE WEIGHT (gr aas)						
PERMEATE RATE (gr./hr.)	94.8100	63.5145	59.6235		50.2992	22.3770	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	32	32	31		31	33	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-3	-3	0		0	-6	SOLUTE REJECTION						

EMP - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 500 P
 SYSTEM TEMP. (avg.) - 23.3
 INITIAL FEED CONC. (MMOL/L) -
 FINAL FEED CONC. (MMOL/L) -

PHASE - CYCLOHEXANE
 RUN NO. - 50
 DATE - 31/3/86

PHASE - CYCLOHEXANE
 RUN NO. - 49
 DATE - 31/3/86

WORKING PRESSURE 500 PSI
 SYSTEM TEMP. (avg.) - 24.3 C

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CIA2	CIA1	PAN3	PAN1
SAMPLE TIME (min.)	4.0000	5.0000	5.0000	4.0000	4.0000	5.0000
BOTTLE WEIGHT (grams)	22.3546	22.8922	21.9637	22.3847	22.3994	
BOTTLE+SAMPLE WEIGHT (grams)	27.6262	27.8349	26.9914	27.3580	27.0481	
SAMPLE WEIGHT (grams)	5.2716	4.9427	5.0277	4.9733	4.6487	
PERMEATE RATE (gr./hr.)	79.0740	59.3124	60.3324	74.5995	55.7844	
SOLUTE CONC. IN PERMEATE	35	34	32	34	37	
% SOLUTE REJECTION	-17	-13	-7	-20	-23	

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

PHASE-
RUN NO.-
DATE-

1000 PSI
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

32

PHASE- CYCLOHEXANE
RUN NO.- 51
DATE- 31/3/76

PRODUCT RUN
CONC (MOL/LM)

32

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
RENAME TYPE	CAR2	CAB1	CTA2	CTA1	PAN3	PAN1	RENAME TYPE	CAR2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	2.0000	2.0000	2.0000		2.0000	3.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.7382	22.4374	22.9355		22.5933	22.8454	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	28.0946	26.5853	27.1008		27.5119	27.4227	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	5.3564	4.1479	4.1653		4.9186	4.5773	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	140.6920	124.4370	124.9590		147.5580	91.5460	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	30	32	30		34	35	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	6	0	6		-6	-9	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE- 1000 F
SYSTEM TEMP. (avg.)- 24
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

PHASE- CYCLOHEXANE
RUN NO.- 53
DATE- 31/3/86
PRODUCT RUN n-OCYLAHME
CONC. (MMOLAR) 21

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 26.5 C

PHASE- CYCLOHEXANE
RUN NO.- 52
DATE- 31/3/86

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3,000	3,000	3,000	3,000	3,000	4,000
BOTTLE WEIGHT (grams)	22,498	22,1124	22,7847	22,2324	21,7120	
BOTTLE+SAMPLE WEIGHT (grams)	26,1222	25,7593	27,7935	27,2240	25,4042	
SAMPLE WEIGHT (grams)	3,6241	3,6469	5,0088	4,9916	3,6122	
PERMEATE RATE (gr./hr.)	72,4820	72,9386	100,1740	99,8320	54,1830	
SOLUTE CONC. IN PERMEATE	19	18	18	18	24	
% SOLUTE REJECTION	10	14	14	14	-14	

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -

PURE SOLVENT RUN

PHASE -
RUN NO. -
DATE -

500 PSI
24.5 C
INITIAL FEED CONC. (F1) - 20
FINAL FEED CONC. (F2) - 19

PRODUCT RUN n-CTYLALINE
CONC. (WOLAN) 20

PHASE - CYCLOHEXANE
RUN NO. - 54
DATE - 31/7/86

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMORANDUM TYPE	CAR2	CAB1	CTA2	CTA1	PAB3	PAB1	MEMORANDUM TYPE	CAR2	CAB1	CTA2	CTA1	PAB3	PAB1
SAMPLE TIME (min.)	7.0000	7.0000	7.0000		7.0000	9.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (gr ams)	22.1799	22.4806	21.9106		22.7740	22.8614	BOTTLE WEIGHT (gr ams)						
BOTTLE+SAMPLE WEIGHT (gr ams)	26.9665	26.4931	26.4479		27.5149	26.2818	BOTTLE+SAMPLE WEIGHT (gr ams)						
SAMPLE WEIGHT (gr ams)	4.7666	4.0125	4.5373		4.7409	3.4204	SAMPLE WEIGHT (gr ams)						
PENMEATE RATE (gr./hr.)	40.8566	34.3929	38.8911		40.6363	22.8027	PENMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PENMEATE	22	19	21		19	20	SOLUTE CONC. IN PENMEATE						
SOLUTE REJECTION	-10	5	-5		5	0	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 56
DATE- 1/4/86

PRODUCT RUN DIBENZYLAMINE
CONC. (MMOL/L) 36

WORKING PRESSURE-
SYSTEM TEMP. (avg.)- 26
INITIAL FEED CONC. (MMOL/L)- 3
FINAL FEED CONC. (MMOL/L)- 3

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 25.25 C

PHASE- CYCLOHEXANE
RUN NO.- 55
DATE- 1/4/86

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	4.0000	4.0000	4.0000	4.0000	4.0000
BOTTLE WEIGHT (gr aas)	22.4743	22.4498	21.8815	22.6237	22.3967	22.1445
BOTTLE+SAMPLE WEIGHT (gr aas)	27.2506	26.1203	25.7474	28.1807	26.1445	26.1445
SAMPLE WEIGHT (gr aas)	4.8263	3.6505	3.8659	5.5570	3.7498	3.7498
PERMEATE RATE (gr./hr.)	72.3945	54.7575	57.9865	83.3550	56.5470	56.5470
SOLUTE CONC. IN PERMEATE	35	34	34	35	38	38
% SOLUTE REJECTION	3	6	6	3	-6	-6

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

PRODUCT RUN BIDENTYLAMINE
(CONC. (MOLES/L))

CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000	CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000
HEXAMINE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1	HEXAMINE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3,0000	3,0000	3,0000	3,0000	3,0000	3,0000	SAMPLE TIME (min.)	3,0000	3,0000	3,0000	3,0000	3,0000	3,0000
BOTTLE WEIGHT (grams)	22,3477	23,0664	22,4007		22,9677	22,4563	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	29,0102	28,2071	28,1464		31,2125	27,5322	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	6,6625	5,1207	5,6657		8,2448	5,0759	SAMPLE WEIGHT (grams)						
PENEGATE RATE (gr./hr.)	133,2500	102,4140	113,3140		164,8760	101,5180	PENEGATE RATE (gr./hr.)						
SOLUTE CONC. IN PENEGATE	34	34	33		33	38	SOLUTE CONC. IN PENEGATE						
SOLUTE REACTION	3	3	6		6	-9	SOLUTE REACTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 50
DATE- 1/4/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 50
DATE- 1/4/86

WORKING PRESSURE- 1000
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (MMOL/L)-
FINAL FEED CONC. (MMOL/L)-

PRODUCT RUN 1-DECAHETYL
CONC. (MMOL/L) 52

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAH2	CAH1	CTA2	CTA1	PAH3	PAH1
SAMPLE TIME (min.)	5.0000	5.0000	3.0000	2.0000	2.0000	2.0000
BOTTLE WEIGHT (grams)	22.3777	22.5652	22.1924	22.1567	22.3735	22.3735
BOTTLE+SAMPLE WEIGHT (grams)	26.1212	26.9212	27.8073	28.3599	28.1018	28.1018
SAMPLE WEIGHT (grams)	3.7435	4.3560	5.6149	6.2032	3.7283	3.7283
PERMEATE RATE (gr./hr.)	44.9720	52.2720	112.2980	186.0960	111.8490	111.8490
SOLUTE CONC. IN PERMEATE	31	32	35	32	31	31
% SOLUTE REJECTION	3	0	-9	0	3	3

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 60
 DATE- 1/4/86

PRODUCT RUN 1-BECAMETHOL
 CONC (MOLAR) 32

WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 25.5 C
 INITIAL FEED CONC. (F1)- 32
 FINAL FEED CONC. (F2)- 32

PHASE-
 RUN NO.-
 DATE-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PMA3	PMA1	MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PMA3	PMA1
SAMPLE TIME (min.)	12.0000	12.0000	5.0000		4.0000	4.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.4681	22.5574	22.3300		22.6590	22.3644	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	26.6344	27.3959	27.0458		28.7969	26.1241	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	4.1663	4.8385	4.7158		6.1399	3.7597	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	20.7315	24.1925	56.5896		92.0985	56.3955	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	32	32	32		32	33	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	0	0	0		0	-3	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 61
DATE- 2/4/86

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 62
DATE- 2/4/86

WORKING PRESSURE- 500
SYSTEM TEMP. (avg.)- 2
INITIAL FEED CONC. (MMOL/L)-
FINAL FEED CONC. (MMOL/L)-

PRODUCT RUN n-HEPTANE
CONC. (MMOL/L) 47

CELL #	1	2	3	4	5	6
RENAME TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	13.0000	13.0000	5.0000	5.0000	3.0000	4.0000
BOTTLE WEIGHT (gr ams)	21.8083	22.4882	22.3378	22.9083	22.8541	22.8541
BOTTLE+SAMPLE WEIGHT (gr ams)	28.4440	29.5873	27.2040	27.9343	27.4737	27.4737
SAMPLE WEIGHT (gr ams)	6.6377	7.1071	4.8720	5.0280	4.6196	4.6196
PENETRATE RATE (gr./hr.)	30.7278	32.8020	58.4440	100.5600	69.2940	69.2940
SOLUTE CONC. IN PENETRATE	42	47	46	49	41	41
SOLUTE REJECTION	11	0	2	-4	13	13

EMP - NEPTUNE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PRODUCT RUN
CONC (WGLAR)

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-

EMP - NEPTUNE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMORANDUM TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMORANDUM TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	4.0000	3.0000		2.0000	2.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (gr ams)	22.7409	22.2729	22.0735		21.7263	22.0085	BOTTLE WEIGHT (gr ams)						
BOTTLE+SAMPLE WEIGHT (gr ams)	28.2466	27.7738	28.0667		28.4998	26.5429	BOTTLE+SAMPLE WEIGHT (gr ams)						
SAMPLE WEIGHT (gr ams)	5.4717	5.4509	6.0132		6.7735	4.5344	SAMPLE WEIGHT (gr ams)						
PERMEATE RATE (gr./hr.)	82.0735	81.7435	120.2440		209.2050	136.0320	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	47	45	45		44	44	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-12	-7	-7		-5	-5	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 64
 DATE- 2/4/86

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 65
 DATE- 2/4/86

WORKING PRESSURE- 1000 PSI
 SYSTEM TEMP. (avg.)- 26
 INITIAL FEED CONC. (MMOLAR)
 FINAL FEED CONC. (MMOLAR)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	3.0000	3.0000	3.0000	2.0000	2.0000
BOTTLE WEIGHT (gr aas)	21.9897	22.7548	22.6672		22.3213	22.6301
BOTTLE+SAMPLE WEIGHT (gr aas)	26.7251	27.1797	28.2264		28.8892	28.5318
SAMPLE WEIGHT (gr aas)	4.7354	4.4249	5.5592		6.5679	3.9017
PERMEATE RATE (gr./hr.)	94.7080	88.4980	111.1840		191.0370	117.0510

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	3.0000	3.0000		2.0000	2.0000
BOTTLE WEIGHT (gr aas)	22.9875	22.6482	21.7896		22.2918	22.8396
BOTTLE+SAMPLE WEIGHT (gr aas)	28.9054	27.7374	27.5763		29.0971	27.1537
SAMPLE WEIGHT (gr aas)	5.9179	5.0892	5.7867		6.8053	4.3141
PERMEATE RATE (gr./hr.)	118.3580	101.7840	115.7340		204.1590	129.4230
SOLUTE CONC. IN PERMEATE	60	36	37		40	40
% SOLUTE REJECTION	-8	3	0		-8	-8

EMP - HEPTANE, TOLUENE PROJECT

EMP - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 66
 DATE- 2/4/86
 WORKING PRESSURE- 500 PSI
 SYSTEM TEMP. (avg.)- 25.5 C
 PURE SOLVENT RUN
 DATE-
 36 INITIAL FEED CONC. (F1)- 37
 FINAL FEED CONC. (F2)- 35

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
HEPTANE TYPE	CAB2	CAB1	CTA2	CTA1	PMS3	PMS1	HEPTANE TYPE	CAB2	CAB1	CTA2	CTA1	PMS3	PMS1
SAMPLE TIME (min.)	4.0000	4.0000	4.0000		3.0000	3.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	23.0206	22.1818	22.8269		22.5349	22.4883	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	27.1974	25.6508	26.5837		27.5327	25.6710	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	4.1740	3.4690	3.7548		4.9978	3.1827	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	62.6520	52.0350	56.3520		99.9560	63.6540	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	40	37	37		36	37	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-11	-3	-3		0	-3	SOLUTE REJECTION						

EMR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 67
DATE- 3/4/86

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

EMR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 68
DATE- 3/4/86

PRODUCT RUN NAPHTHALENE
CONC. (MMOLAR) 30

WORKING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 24.1
INITIAL FEED CONC. (MMOLAR)
FINAL FEED CONC. (MMOLAR)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	4.0000	4.0000	3.0000	3.0000	3.0000
BOTTLE WEIGHT (grams)	22.0351	22.5985	22.5792	22.4920	22.2932	
BOTTLE+SAMPLE WEIGHT (grams)	26.9251	26.4073	26.5207	27.6762	25.6842	
SAMPLE WEIGHT (grams)	4.8900	3.8088	3.9415	5.1842	3.3910	
PERMEATE RATE (gr./hr.)	73.3500	57.1320	59.1225	103.6840	67.8200	
SOLUTE CONC. IN PERMEATE	30	29	41	30	31	
SOLUTE REJECTION	0	3	-37	0	-3	

EMR - HEPTANE, TOLUENE PROJECT

EMR - HEPTANE, TOLUENE PROJECT

PHASE -
RUN NO. -
DATE -

PHASE -
RUN NO. -
DATE -

1000 PSI
26 C

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -
26 INITIAL FEED CONC. (F1) -
FINAL FEED CONC. (F2) -

PRODUCT RUN
CONC. (MOLAR)

CYCLOHEXANE
69
3/4/86

PURE SOLVENT RUN

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
PERMEATE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1	PERMEATE TYPE	CAB2	CAB1	CTA2	CTA1	PM3	PM1
SAMPLE TIME (min.)	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	SAMPLE TIME (min.)	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
BOTTLE WEIGHT (gr aas)	21.7861	22.5290	22.3362		22.2749	22.0911	BOTTLE WEIGHT (gr aas)						
BOTTLE+SAMPLE WEIGHT (gr aas)	26.2301	26.1797	26.2581		26.0976	26.6667	BOTTLE+SAMPLE WEIGHT (gr aas)						
SAMPLE WEIGHT (gr aas)	4.4440	3.6507	3.9219		6.8227	4.5756	SAMPLE WEIGHT (gr aas)						
PERMEATE RATE (gr./hr.)	133.3260	109.3210	117.6570		204.4810	137.2680	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	29	26	29		30	32	SOLUTE CONC. IN PERMEATE						
I SOLUTE REJECTION	-12	0	-12		-15	-23	I SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 70
DATE- 3/4/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PURE SOLVENT RUN

WORKING PRESSURE- 1000 PSI
SYSTEM TEMP. (avg.)- 24
INITIAL FEED CONC. (MMOLAR) 3
FINAL FEED CONC. (MMOLAR) 2

PHASE- CYCLOHEXANE
RUN NO.- 71
DATE- 3/4/86

PRODUCT RUN 2 METHYLMETHYLENE
CONC. (MMOLAR) 37

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMS3	PMA1
SAMPLE TIME (min.)	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
BOTTLE WEIGHT (grams)	22.0084	21.8292	22.2285	22.2476	22.3540	22.4142
BOTTLE+SAMPLE WEIGHT (grams)	26.0704	25.7664	25.9897	28.8721	26.4886	26.2682
SAMPLE WEIGHT (grams)	4.0620	3.9372	3.7632	6.6245	4.1346	3.7920
PERMEATE RATE (gr./hr.)	121.8600	103.1160	112.8960	198.7350	124.0380	
SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION						

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PMS3	PMA1
SAMPLE TIME (min.)	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
BOTTLE WEIGHT (grams)	22.4895	21.8763	22.3942	23.0496	22.4142	
BOTTLE+SAMPLE WEIGHT (grams)	26.6665	25.2436	26.6136	29.4136	26.2682	
SAMPLE WEIGHT (grams)	4.1770	3.3673	3.7274	6.3640	3.7920	
PERMEATE RATE (gr./hr.)	125.3100	101.0190	111.8220	190.9200	113.7600	
SOLUTE CONC. IN PERMEATE	36	37	43	38	42	
SOLUTE REJECTION	3	0	-16	-3	-14	

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 72
DATE- 3/4/86

WORKING PRESSURE- 500 PSI
PRODUCT RUN 2 METHYLAMINOTEMPER. (avg.)- 24 C
CONC. (MOLECULAR) 30 INITIAL FEED CONC. (F1)- 36
FINAL FEED CONC. (F2)- 26

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-

PURE SOLVENT RUN

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	4.0000	4.0000	4.0000	3.0000	4.0000	SAMPLE TIME (min.)	4.0000	4.0000	4.0000	4.0000	4.0000	4.0000
BOTTLE WEIGHT (grams)	22.4183	22.1785	22.7223		21.9809	22.0064	BOTTLE WEIGHT (grams)	22.4183	22.1785	22.7223		21.9809	22.0064
BOTTLE+SAMPLE WEIGHT (grams)	26.6349	25.6796	26.4577		26.9008	25.7969	BOTTLE+SAMPLE WEIGHT (grams)	26.6349	25.6796	26.4577		26.9008	25.7969
SAMPLE WEIGHT (grams)	4.2166	3.5011	3.7354		4.9199	3.7845	SAMPLE WEIGHT (grams)	4.2166	3.5011	3.7354		4.9199	3.7845
PERMEATE RATE (gr./hr.)	63.2490	52.5165	56.0310		98.3980	56.7675	PERMEATE RATE (gr./hr.)	63.2490	52.5165	56.0310		98.3980	56.7675
SOLUTE CONC. IN PERMEATE	40	37	41		35	40	SOLUTE CONC. IN PERMEATE	40	37	41		35	40
SOLUTE REJECTION	-33	-23	-37		-17	-33	SOLUTE REJECTION	-33	-23	-37		-17	-33

EMR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE - 1000 PSI
SYSTEM TEMP. (AVG.) - 25.25 C

WORKING PRESSURE - 1000 PSI
SYSTEM TEMP. (AVG.) - 25
INITIAL FEED CONC. (MMOLAR) -
FINAL FEED CONC. (MMOLAR) -

PHASE - CYCLOHEXANE
RUN NO. - 77
DATE - 4/4/86

PHASE - CYCLOHEXANE
RUN NO. - 76
DATE - 4/4/86

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	3.0000	3.0000	2.0000	2.0000	2.0000
BOTTLE WEIGHT (grams)	22.3059	21.7108	22.0985	22.7812	22.6214	
BOTTLE+SAMPLE WEIGHT (grams)	28.2899	26.7577	27.6436	29.6252	26.7649	
SAMPLE WEIGHT (grams)	5.9840	5.0469	5.5451	6.8440	4.1435	
PERMEATE RATE (gr./hr.)	119.6800	100.8380	110.9020	205.3700	124.3050	

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	3.0000	3.0000	2.0000	2.0000	2.0000
BOTTLE WEIGHT (grams)	22.3514	22.5364	22.3838	21.9631	22.4443	
BOTTLE+SAMPLE WEIGHT (grams)	28.8391	27.7908	27.9262	28.3700	26.1063	
SAMPLE WEIGHT (grams)	ERR	6.4877	5.2544	6.4069	3.6620	
PERMEATE RATE (gr./hr.)	ERR	129.7540	195.0880	192.2070	109.8600	
SOLUTE CONC. IN PERMEATE	35	34	37.	38	44	
% SOLUTE REJECTION	3	6	-3	-6	-22	

ENR - HEPTANE, TOLUENE PROJECT

PHASE-
RUN NO.-
DATE-
CYCLOTIME
78
4/4/86

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (F1)-
FINAL FEED CONC. (F2)-
500 PSI
24.5 C
35
35

ENR - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAM3	PAM1	CAR2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000						
BOTTLE WEIGHT (gr ams)	22.4136	22.3644	22.2006		22.4798	22.5552						
BOTTLE+SAMPLE WEIGHT (gr ams)	27.2717	26.4590	26.7100		26.9978	26.7559						
SAMPLE WEIGHT (gr ams)	4.8581	4.0946	4.4294		4.5180	4.2007						
PENMEATE RATE (gr./hr.)	58.2972	49.1352	53.1528		90.3600	50.4084						
SOLUTE CONC. IN PENMEATE	34	36	36		36	40						
SOLUTE REJECTION	3	-3	-3		-3	-14						

ENR - HEPTANE, TOLUENE PROJECT

PHASE - CYCLOHEXANE
RUN NO. - 79
DATE - 7/4/86

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 25.5 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE - CYCLOHEXANE
RUN NO. - 80
DATE - 7/4/86

PRODUCT RUN
CONC. (MMDLAR) - 26

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 26
INITIAL FEED CONC. (MMDLAR) -
FINAL FEED CONC. (MMDLAR) -

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CA2	CA1	CA2	CA1	CA3	CA1
SAMPLE TIME (min.)	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000
BOTTLE WEIGHT (grams)	22.4377	22.0283	22.3759	22.4728	21.9955	
BOTTLE+SAMPLE WEIGHT (grams)	28.8185	27.2583	27.9109	32.4017	28.3748	
SAMPLE WEIGHT (grams)	6.3808	5.2300	5.5350	10.1289	6.3793	
PERMEATE RATE (gr./hr.)	63.8000	52.3000	55.3500	101.2890	69.7930	

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CA2	CA1	CA2	CA1	CA3	CA1
SAMPLE TIME (min.)	4.0000	4.0000	4.0000	4.0000	4.0000	4.0000
BOTTLE WEIGHT (grams)	22.8810	22.7175	22.4481	22.3077	22.5285	
BOTTLE+SAMPLE WEIGHT (grams)	27.5926	26.4313	26.3110	27.4849	26.2408	
SAMPLE WEIGHT (grams)	4.7116	3.7138	3.8629	5.1771	3.7123	
PERMEATE RATE (gr./hr.)	70.6740	55.7070	57.9435	107.5420	74.2460	
SOLUTE CONC. IN PERMEATE	25	27	25	26	28	
% SOLUTE REJECTION	4	-4	4	0	-8	

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLING TIME
 RUN NO.- 81
 DATE- 7/1/86

PRODUCT RUN
 CONC (MOL/L) 26

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)- 26
 INITIAL FEED CONC. (F1)- 26
 FINAL FEED CONC. (F2)- 26

ENR - HEPTANE, TOLUENE PROJECT

PURE SOLVENT RUN

WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAR2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	3.0000	3.0000	3.0000		2.0000	2.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.7478	21.9946	22.4674		22.9119	22.5142	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	29.2274	27.3678	28.2934		30.1533	28.9148	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	6.4796	5.3732	5.8260		7.2414	6.4006	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	129.5920	107.4440	116.5200		217.2420	132.0180	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	32	26	26		26	28	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	-23	0	0		0	-8	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO. - 82
DATE- 7/4/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.) - 25 C

PURE SOLVENT RUN

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO. - 83
DATE- 7/4/86

WORKING PRESSURE- 1000
SYSTEM TEMP. (avg.) - 25.
INITIAL FEED CONC. (MMOL/L) -
FINAL FEED CONC. (MMOL/L) -

PRODUCT RUN BENZOTHIOPHENE
CONC. (MMOL/L) 34

CELL #	1	2	3	4	5	6
RENAME TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	3.0000	3.0000	2.0000	2.0000	2.0000
BOTTLE WEIGHT (gr ams)	22.6036	22.3975	22.7476	22.4909	22.1589	
BOTTLE+SAMPLE WEIGHT (gr ams)	28.9805	27.5577	28.2496	29.2133	26.2712	
SAMPLE WEIGHT (gr ams)	6.2769	5.1602	5.5220	6.7224	4.1123	
PERMEATE RATE (gr./hr.)	125.5380	103.2040	110.4400	201.6720	123.3490	
SOLUTE CONC. IN PERMEATE	33	34	35	33	40	
% SOLUTE REJECTION	3	0	-3	3	-18	

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 84
DATE- 7/4/86

PRODUCT RUN BENZOTHIOPHENE
CONC. (MOL/LM) 34

MORNING PRESSURE- 500 PSI
SYSTEM TEMP. (avg.)- 25.5 C
INITIAL FEED CONC. (F1)- 33
FINAL FEED CONC. (F2)- 34

ENR - HEPTANE, TOLUENE PROJECT

MORNING PRESSURE-
SYSTEM TEMP. (avg.)-

PURE SOLVENT RUN

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMORANDUM TYPE	CAB2	CAB1	CTA2	CTA1	PMS3	PMS1	MEMORANDUM TYPE	CAB2	CAB1	CTA2	CTA1	PMS3	PMS1
SAMPLE TIME (min.)	5.0000	5.0000	5.0000		4.0000	4.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.0955	22.2539	22.5782		23.0337	22.1383	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	26.9914	26.4326	27.2084		29.8975	26.4320	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	4.8959	4.1987	4.6302		6.8638	4.2937	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	58.7508	50.3844	55.5624		102.9570	64.4055	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	29	34	33		34	36	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	15	0	3		0	-6	SOLUTE REJECTION						

ENR - HEPTANE, TOLUENE PROJECT

PHASE - CYCLOHEXANE
RUN NO. - 85
DATE - 8/4/86

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 25.25 C

PURE SOLVENT RUN

PHASE - CYCLOHEXANE
RUN NO. - 85
DATE - 8/4/86

WORKING PRESSURE - 500 PSI
SYSTEM TEMP. (avg.) - 25.25 C

ENR - HEPTANE, TOLUENE PROJECT

PHASE - CYCLOHEXANE
RUN NO. - 86
DATE - 8/4/86

PRODUCT RUN
CONC. (MMOLAR) 207

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -
INITIAL FEED CONC. (MMOLAR) -
FINAL FEED CONC. (MMOLAR) -

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	5.0000	7.0000	10.0000		4.0000	4.0000
BOTTLE WEIGHT (grams)	21.5239	22.0497	22.3580		22.0315	22.3999
BOTTLE+SAMPLE WEIGHT (grams)	25.5384	25.3015	26.0224		28.0968	27.3091
SAMPLE WEIGHT (grams)	4.0145	3.2518	3.6644		6.0653	4.9092
PERMEATE RATE (gr./hr.)	48.1740	27.8726	21.9844		90.9795	74.8380
SOLUTE CONC. IN PERMEATE	196	199	238		237	236
% SOLUTE REJECTION	5	4	-15		-14	-14

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE - CYCLOHEXANE
RUN NO. - 87
DATE - 8/4/86

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -
INITIAL FEED CONC. (F1) -
FINAL FEED CONC. (F2) -

PRODUCT RUN
CONC (MOL/LR) 207

1000 PSI
25 C
207
208

PURE SOLVENT RUN

WORKING PRESSURE -
SYSTEM TEMP. (avg.) -

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

6,0000

7,0000

8,0000

9,0000

10,0000

11,0000

12,0000

13,0000

14,0000

15,0000

16,0000

17,0000

CELL #

1,0000

2,0000

3,0000

4,0000

5,0000

EHR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 88
DATE- 8/4/86

WORKING PRESSURE 1000 PSI
SYSTEM TEMP. (avg.)- 25 C

PURE SOLVENT RUN

EHR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
RUN NO.- 89
DATE- 8/4/86

PRODUCT RUN
CONC. (MOLAR) 34

WORKING PRESSURE- 1000
SYSTEM TEMP. (avg.)-
INITIAL FEED CONC. (MOLAR)
FINAL FEED CONC. (MOLAR)-

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	3.0000	4.0000	4.0000	2.0000	2.0000	2.0000
BOTTLE WEIGHT (grams)	22.9447	22.0306	22.3151	22.2404	22.4969	22.6703
BOTTLE+SAMPLE WEIGHT (grams)	27.5378	25.7042	26.0122	29.1626	26.9186	26.2491
SAMPLE WEIGHT (grams)	4.5931	3.6736	3.6971	6.9222	4.4227	3.5708
PERMEATE RATE (gr./hr.)	91.8420	55.1040	55.4565	207.6660	132.6810	107.3640
SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION						

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	4.0000	5.0000	5.0000	2.0000	2.0000	2.0000
BOTTLE WEIGHT (grams)	22.8401	22.4323	22.3594	22.9478	22.6703	22.6703
BOTTLE+SAMPLE WEIGHT (grams)	27.7547	26.1888	26.0255	28.7189	26.2491	26.2491
SAMPLE WEIGHT (grams)	4.9146	3.7565	3.6661	5.7711	3.5708	3.5708
PERMEATE RATE (gr./hr.)	73.7190	45.0780	43.9932	175.1330	107.3640	107.3640
SOLUTE CONC. IN PERMEATE	35	38	39	35	41	41
SOLUTE REJECTION	-3	-12	-15	-3	-21	-21

ENR - HEPTANE, TOLUENE PROJECT

ENR - HEPTANE, TOLUENE PROJECT

PHASE- CYCLOHEXANE
 RUN NO.- 70
 DATE- 8/4/86
 PRODUCT RUN 0-CRESOL
 CONC (MOL/L) 35
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-
 INITIAL FEED CONC. (F1)-
 FINAL FEED CONC. (F2)-
 500 PSI
 25 C
 35
 34
 PHASE-
 RUN NO.-
 DATE-
 PURE SOLVENT RUN
 WORKING PRESSURE-
 SYSTEM TEMP. (avg.)-

CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	CELL #	1.0000	2.0000	3.0000	4.0000	5.0000	6.0000
MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1	MEMBRANE TYPE	CAR2	CAR1	CTA2	CTA1	PAM3	PAM1
SAMPLE TIME (min.)	8.0000	10.0000	10.0000		4.0000	4.0000	SAMPLE TIME (min.)						
BOTTLE WEIGHT (grams)	22.6630	22.9105	22.5808		21.7849	22.0327	BOTTLE WEIGHT (grams)						
BOTTLE+SAMPLE WEIGHT (grams)	27.7328	26.7402	26.1965		27.7955	25.6090	BOTTLE+SAMPLE WEIGHT (grams)						
SAMPLE WEIGHT (grams)	5.0698	3.8297	3.6157		5.8106	3.5763	SAMPLE WEIGHT (grams)						
PERMEATE RATE (gr./hr.)	38.0235	22.9782	21.6942		87.1590	53.6445	PERMEATE RATE (gr./hr.)						
SOLUTE CONC. IN PERMEATE	34	25	40		36	39	SOLUTE CONC. IN PERMEATE						
SOLUTE REJECTION	3	29	-14		-3	-11	SOLUTE REJECTION						

END - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE- 500 P
SYSTEM TEMP. (avg.)- 25.5 C
INITIAL FEED CONC. (MMOLAR)-
FINAL FEED CONC. (MMOLAR)-

PHASE- CYCLOHEXANE
RUN NO.- 92
DATE- 9/4/86

PRODUCT RUN
CONC. (MMOLAR) 31

END - HEPTANE, TOLUENE PROJECT

WORKING PRESSURE 500 PSI
SYSTEM TEMP. (avg.)- 25.5 C

PHASE- CYCLOHEXANE
RUN NO.- 91
DATE- 9/4/86

PURE SOLVENT RUN

CELL #	1	2	3	4	5	6
MEMBRANE TYPE	CAB2	CAB1	CYK2	CYK1	PAM3	PAM1
SAMPLE TIME (min.)	6.0000	12.0000	12.0000	4.0000	4.0000	4.0000
BOTTLE WEIGHT (grams)	22.6009	22.1375	22.7952	22.7818	22.3528	
BOTTLE+SAMPLE WEIGHT (grams)	26.9474	27.1606	27.2027	29.0520	26.4377	
SAMPLE WEIGHT (grams)	4.2465	5.0231	4.4075	6.2702	4.0849	
PERMEATE RATE (gr./hr.)	42.4650	25.1155	22.0375	94.0530	61.2735	
SOLUTE CONC. IN PERMEATE	32	40	36	40	34	
X SOLUTE REJECTION	-3	-29	-16	-29	-10	

ENR - HEPTANE, TOLUENE PROJECT

PHASE: CYCLOHEXANE
 RUN NO.: 93
 DATE: 9/4/86

PRODUCT RUN
 CONC.(MOL/LAR)

PHENOL
 30

WORKING PRESSURE -
 SYSTEM TEMP. (avg.) -
 INITIAL FEED CONC. (F1) -
 FINAL FEED CONC. (F2) -

1000 PSI
 25 C
 26
 33

ENR - HEPTANE, TOLUENE PROJECT

PURE SOLVENT RUN
 WORKING PRESSURE -
 SYSTEM TEMP. (avg.) -

CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000	CELL #	1,0000	2,0000	3,0000	4,0000	5,0000	6,0000
MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1	MEMBRANE TYPE	CAB2	CAB1	CTA2	CTA1	PAN3	PAN1
SAMPLE TIME (min.)	4,0000	5,0000	5,0000	2,0000	2,0000	2,0000	SAMPLE TIME (min.)	4,0000	5,0000	5,0000	2,0000	2,0000	2,0000
BOTTLE WEIGHT (grams)	22,4781	22,8198	22,5278	22,3993	22,8669		BOTTLE WEIGHT (grams)	22,4781	22,8198	22,5278	22,3993	22,8669	
BOTTLE+SAMPLE WEIGHT (grams)	27,9508	28,9627	28,3588	28,7042	28,5933		BOTTLE+SAMPLE WEIGHT (grams)	27,9508	28,9627	28,3588	28,7042	28,5933	
SAMPLE WEIGHT (grams)	5,4727	4,1429	3,8310	6,3049	3,7324		SAMPLE WEIGHT (grams)	5,4727	4,1429	3,8310	6,3049	3,7324	
PERMEATE RATE (gr./hr.)	82,0005	49,7148	45,9720	189,1470	111,9720		PERMEATE RATE (gr./hr.)	82,0005	49,7148	45,9720	189,1470	111,9720	
SOLUTE CONC. IN PERMEATE	35	36	30	40	26		SOLUTE CONC. IN PERMEATE	35	36	30	40	26	
SOLUTE REJECTION	-17	-20	0	-33	13		SOLUTE REJECTION	-17	-20	0	-33	13	

APPENDIX E

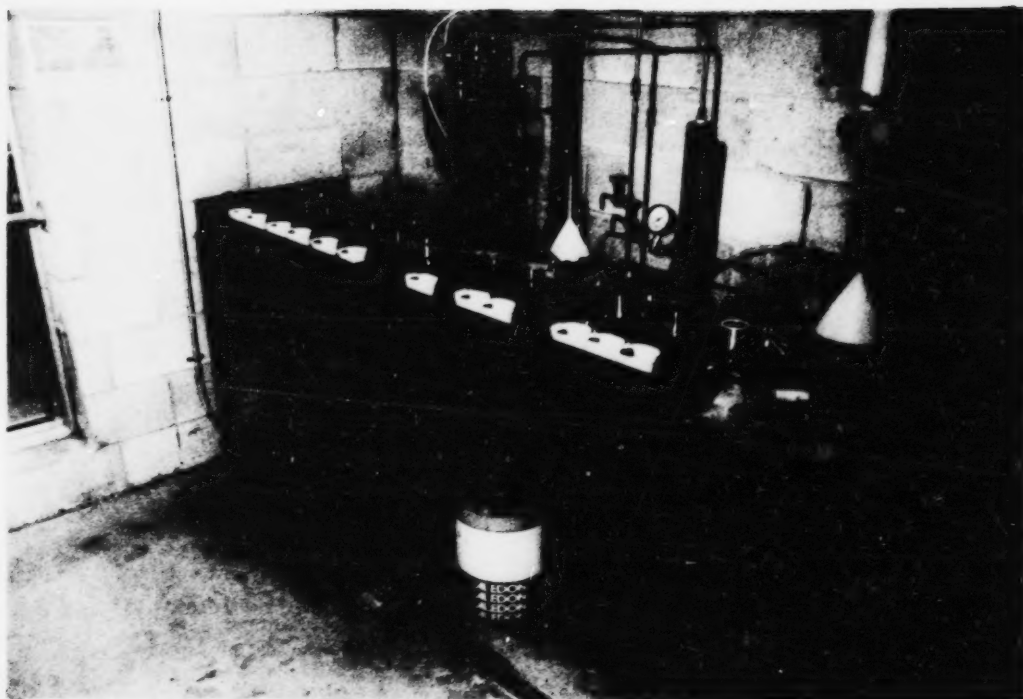
DENSITY-VISCOSITY CORRECTION FACTORS TO 25°C FOR WATER

DENSITY - VISCOSITY CORRECTION FACTORS TO 25°C

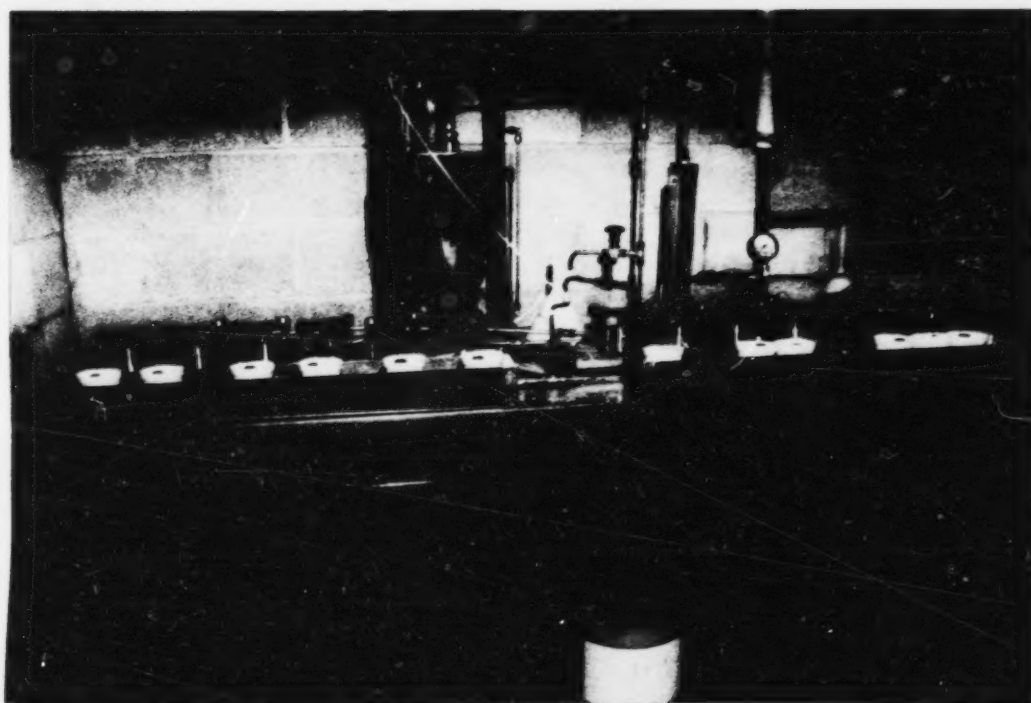
°C	C.F.	°C	C.F.	°C	C.F.	°C	C.F.
1.0	1.9314	18.5	1.1653	28.0	0.9362	47.0	0.6520
1.5	1.8988	19.0	1.1503	28.25	0.9312	48.0	0.6411
2.0	1.8662	19.5	1.1370	28.50	0.9262	49.0	0.6307
2.5	1.8364	20.0	1.1232	28.75	0.9213	50.0	0.6303
3.0	1.8064	20.25	1.1166	29.0	0.9163	51.0	0.6105
3.5	1.7786	20.50	1.1098	29.25	0.9111	52.0	0.6007
4.0	1.7487	20.75	1.1034	29.50	0.9068	53.0	0.5913
4.5	1.7216	21.0	1.0970	29.75	0.9020	54.0	0.5822
5.0	1.6945	21.25	1.0903	30.0	0.8972	55.0	0.5732
5.5	1.6689	21.50	1.0839	30.5	0.8880	56.0	0.5645
6.0	1.6434	21.75	1.0775	31.0	0.8787	57.0	0.5562
6.5	1.6185	22.0	1.0711	31.5	0.8698	58.0	0.5477
7.0	1.5731	22.25	1.0650	32.0	0.8610	59.0	0.5347
7.5	1.5465	22.50	1.0589	32.5	0.8524	60.0	0.5319
8.0	1.5242	22.75	1.0528	33.0	0.8438	61.0	0.5243
8.5	1.5022	23.0	1.0466	33.5	0.8353	62.0	0.5168
9.0	1.5022	23.25	1.0107	34.0	0.8268	63.0	0.5095
9.5	1.4802	23.50	1.0347	34.5	0.8189	64.0	0.5924
10.0	1.4391	23.75	1.0288	35.0	0.8109	65.0	0.4955
10.5	1.4391	24.0	1.0228	35.5	0.8032	66.0	0.4887
11.0	1.4189	24.25	1.0171	36.0	0.7955	67.0	0.4821
11.5	1.3994	24.50	1.0114	36.5	0.7873	68.0	0.4757
12.0	1.3800	24.75	1.0057	37.0	0.7802	69.0	0.4695
12.5	1.3613	25.0	1.0000	37.5	0.7729	70.0	0.4634
13.0	1.3427	25.25	0.9950	38.0	0.7656		
13.5	1.3250	25.50	0.9890	38.5	0.7584		
14.0	1.3073	25.75	0.9835	39.0	0.7514		
14.5	1.2903	26.0	0.9780	39.5	0.7437		
15.0	1.2734	26.25	0.9726	40.0	0.7360		
15.5	1.2715	26.50	0.9673	41.0	0.7243		
16.0	1.2409	26.75	0.9621	42.0	0.7113		
16.5	1.2251	27.0	0.9568	43.0	0.6987		
17.0	1.2095	27.25	0.9516	44.0	0.6866		
17.5	1.1945	27.50	0.9464	45.0	0.6746		
18.0	1.1797	27.75	0.9413	46.0	0.6631		

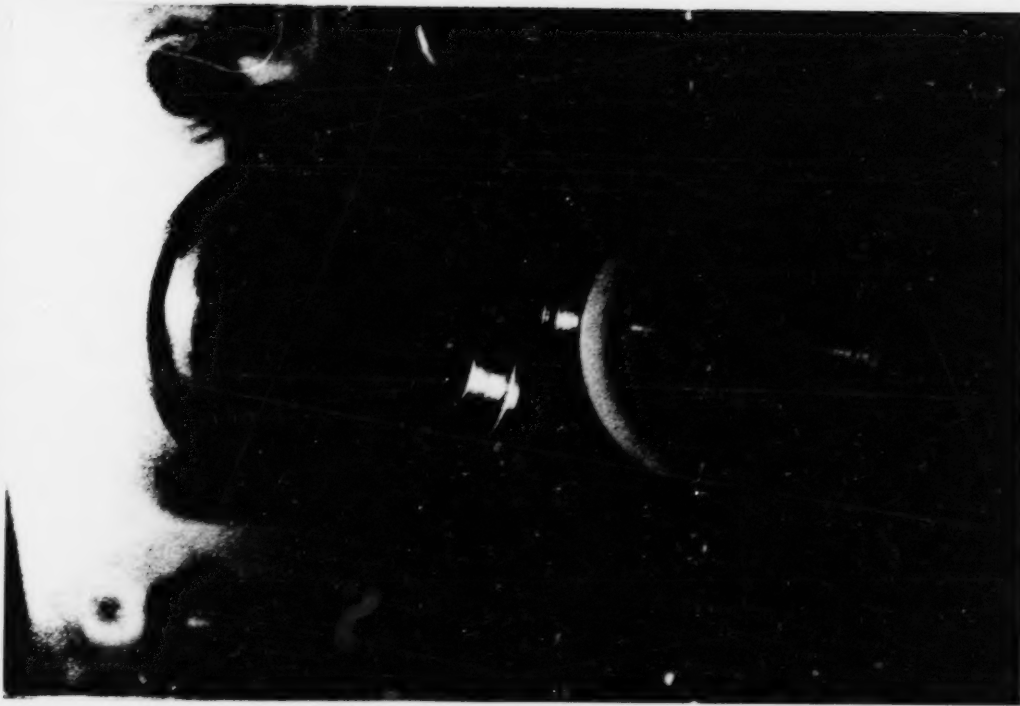
APPENDIX F

PHOTOGRAPHS OF THE CONTINUOUS FLOW TEST SYSTEM
AND NRC TYPE TEST CELL



CONTINUOUS FLOW TEST SYSTEM





NRC TYPE TEST CELL

